Devoted to
TEXTILE
CHEMISTRY
BLEACHING
DYEING
PRINTING
FINISHING

MARCH 1, 1943
VOLUME 32, No. 5

AMERICAN DYESTUFF REPORTER

FFICIAL PUBLICATION
of the
PROCEEDINGS
ERICAN ASSOCIATION
TEXTILE CHEMISTS
AND COLORISTS

Right Dress!

AND FAST COLORS FOR WORK WEAR

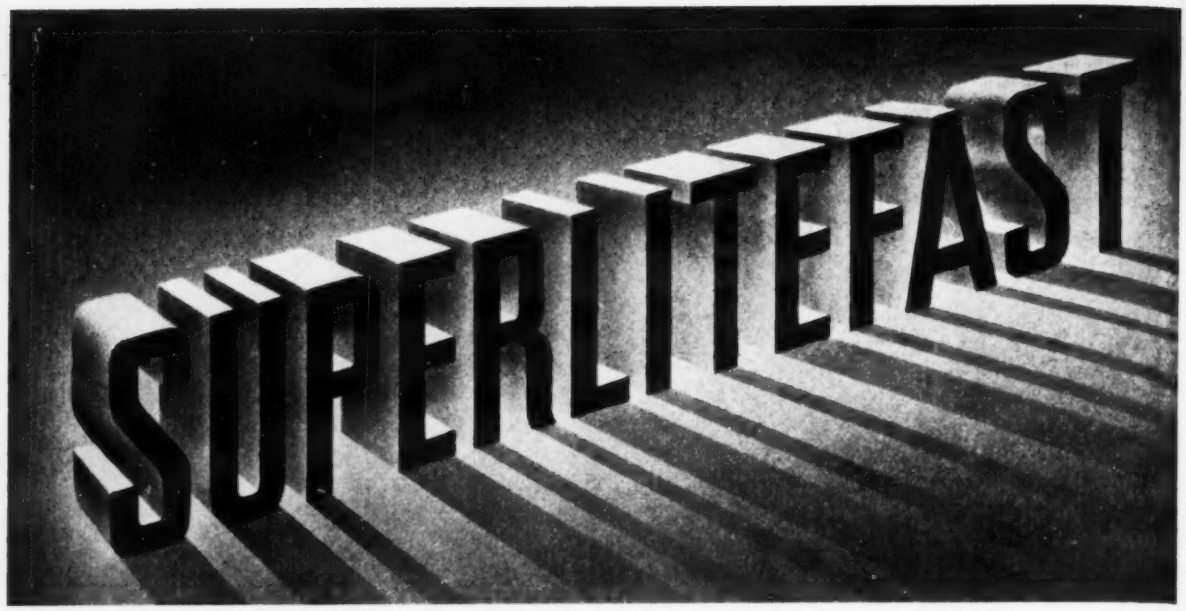
Women do not stop being women when they become war workers. They are still style conscious. They still want to appear at their best.

But they know that work in war plants imposes new demands on clothing. It is subject to grime, grease, perspiration and frequent launderings.

This calls for fast dyes—the fastest available. For colors must not fade noticeably during the long, hard life of the garment. Vat dyes, which can be used on cotton, rayon or linen, should be your first choice when Uncle Sam can spare them.

America's women war workers will expect fast color in tomorrow's clothing.

Build good color value into fabrics for work clothing. Use the fastest dyestuffs available. It helps conserve America's supply of suitable fabrics. And it helps you build your reputation for the increased post-war market. E. I. du Pont de Nemours & Co. (Inc.), Organic Chemicals Department, Dyestuffs Division, Wilmington, Delaware.



DIRECT COLORS

for

O. D. No. 9

COTTON and WOOL

UNDERWEAR and HOSIERY

EXCLUSIVELY FOR

GOVERNMENT REQUIREMENTS

Althouse Chemical Company

READING, PA.

Hosiery Dyers –
Announcement
A great step forward in the Full Fashioned Hosiery Field has been accomplished by recently perfected methods in the dyeing and finishing of the newly developed
CELANESE* Hosiery.
Our technical staff is ready with complete data.
The formulae for the 1943 Spring season hosiery shades are now available

*Reg. U. S. Pat. Off.

AMERICAN ANILINE PRODUCTS, INC.
50 UNION SQUARE NEW YORK, N.Y.

— DYESTUFFS —

BRANCHES

Providence, R. I.
55 Pine Street

Philadelphia, Pa.
210 N. 13th Street

Toronto, Can.
Dominion Anilines & Chemicals, Ltd.
265 Adelaide Street West

Boston
190 High Street

Chicago, Ill.
820 South Clinton Street

Charlotte, N. C.
301 East Seventh Street

Reg. U.S. Pat. Off.

PLANT: Lock Haven, Pa.

See-Worthy legs are a business with me!

GLORIA BARDEAU

The young lady in front of the fireplace knows the importance of see-worthy legs. Says GLORIA—"With professional models, attractive legs are a business . . . with all women they're a necessity, for we know there's a direct line between feminine legs and male hearts. Under today's conditions, can you blame us for being critical in our hosiery buying?"

Whether she's out to stop the fleet or just part of it, every girl knows that "see-worthy" legs are an important part of her charm equipment. Stockings in rayon, cotton or lisle . . . all must have the proper, soft, sheer, eye-caressing, smoky dullness. ■ Today, to make the job of glorifying the most beautiful legs in the world doubly difficult, materials are limited, while feminine demand and criticism is not. Never have we found hosiery makers and dyers more needful of finishes to create sheer, lasting, salable hosiery regardless of the materials used. ■ To solve these problems, our staff has been working "'round-the-clock". A talk with one of our field men will convince you that we have not worked in vain.

W. F. FANCOURT & COMPANY

Phila., Pa., Solving Finishing Problems Since 1904
In the South, Howard A. Virkler, Greensboro, N. C.

DURABILITY AND THE DURATION

Yardage by the mile...these few words best describe the tremendous demands now being made on American textile producers by our armed forces ☆ The material available for civilian use, therefore, must be processed to insure its maximum life ☆ Never was durability more at a premium ☆ There are ample supplies of high-class dyestuffs to meet military requirements and to color all civilian fabrics that will be manufactured.

GENERAL DYESTUFF CORPORATION

Uncle Sam's fighting men in the jungle, in the Arctic, on the desert - - all over the world - - are demanding fabrics finished to meet the extreme conditions of this *new* kind of war. ● Arkansas' vast peacetime experience is now solving wartime problems . . producing for textile processing and finishing plants products that meet exacting government specifications.

FRONT LINE PRODUCTS

FUNGICIDE G For mildewproofing all types of cotton cloth used in sleeping bags, webbing, tentage, mosquito netting, etc.

ARKO FIRE RETARDANT For flame-proofing uniform cloth, tentage, felts, etc.

CULOFIX L* For preventing color-bleed in water of direct dyed cotton.

AQUAROL* Produces a water-repellent finish on uniform cloth, overcoatings, and other military fabrics . . used in a single bath treatment with Fungicide G to impart water-repellency and mildew resistance . . used in a single bath treatment with Arko Fire Retardant to produce water-repellency and fire-resistance.

*REG. U.S. PAT. OFF.

ARKANSAS CO. INC. NEWARK · NEW JERSEY

This advertisement is of special interest to dyestuff Manufacturers and Finishers

THE SQUARE THAT WANTED TO BE AN OBLONG

No. 3 of a series—from our confidential files on the new "CROWN" Tested Plan

This is the story of a converter-manufacturer who makes handkerchiefs . . . squares that wouldn't stay square. They wanted to be oblongs.

Now you know you just could not stay in business if you sold handkerchiefs that lost their shape in washing.

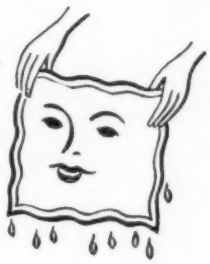
So he asked us if we had any suggestions. We tested the rayon cloth and had the results back to him in 48 hours as promised.

They showed not only excess shrinkage, but color trouble, too. And the shrinkage, in the bargain, was distorting the prints.

Well . . . merely testing fabrics is not our idea of helpful suggestions. We use the tests as a springboard to action that will bring satisfaction. We had a few ideas.

In conference with the manufacturer and his screen-printer, we recommended some slight changes in the chemical formula and the mechanical production routing of the scouring operation. Drying and framing suggestions were also incorporated. As for some of the colors, new dyestuffs were indicated and are at present being used.

Now the handkerchiefs are truly washable . . . their color-fastness and dimensional restorability surpass every requirement of the CROWN Tests. The squares stay square. And they're sold under the green—go ahead and wash it it—CROWN Tested Tag. That's building customer confidence!



What Sells Today?

With fashion and styling leveling off under the standardization necessitated by the war effort . . . what gives you a competitive edge these days?

The answer we think is *service* . . . consumer information and serviceable merchandise. People have to make their war dollars stretch farther than ever before. What they buy must give honest value.

And one way of giving honest value is to sell fabrics that have been tested and passed under the new CROWN Tested Plan. Then you're building customer confidence for today . . . *and* tomorrow!

NEW INFORMATIVE LABELING!

Consumer Satisfaction under the "Three Tag" System

"CROWN" TESTED RAYON FABRICS

REG. U. S. PAT. OFF.

AMERICAN VISCOSE CORPORATION

Producers of CROWN *Rayon Yarns and Staple Fibers*

Sales Offices: 350 Fifth Avenue, New York City; Providence, R. I.; Charlotte, N. C.; Philadelphia, Pa.

Copr. 1943—American Viscose Corp.

LOOKING FOR A GOVERNMENT KHAKI YELLOW

WITH 3 WAY FASTNESS?

LOOK TO SANDOZ

METOMEGA CHROME YELLOW ME

✓ Fast to carbonizing
✓ Fast to light
✓ Fast to fulling

DYES BY ALL CHROME METHODS

No other yellow attains this high rating in fastness in combination with grey and brown. Metomega Chrome Yellow ME also has excellent all-round dyeing properties. A *practical* test in your mill will convince you of the wisdom and economy of using this outstanding Sandoz product.

SANDOZ

SANDOZ CHEMICAL WORKS, INC., 61-63 Van Dam Street, New York, N. Y.

BOSTON, MASS. • CHARLOTTE, N. C. • PATERSON, N. J. • PHILADELPHIA, PA. • PROVIDENCE, R. I. • CHICAGO, ILL. • LOS ANGELES, CALIF.

Non-toxic mildew proofing becomes a reality

In the tropical rains and steaming heat of the South Pacific, the uniforms and equipment of America's fighting men require two protective finishes — water repellency and anti-mildew.

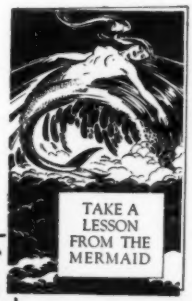
At last you get this double protection in a non-toxic one-bath treatment — Fen-Aseptic. Safe for fabrics and users.

Fen-Aseptic renders fabrics immune to the ravages of mildew . . . keeps men dry.

Fen-Aseptic meets government specifications for ducks and twills for shelter tents, sleeping bags, barracks bags and a wide range of other fabrics. Easily applied on quetsch, padder, jig, beck, starch mangle or continuous process machine, followed by drying at an elevated temperature.

When fabrics require water repellency alone, you can depend on the proved effectiveness of Fen Water Repellent. Used on thousands of yards of fabric now in service on every fighting front.

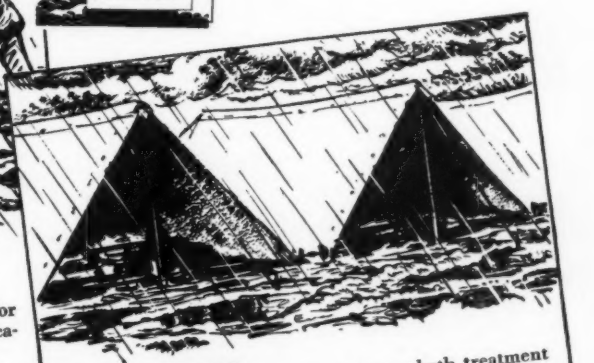
Fen is available three ways — Fen Water Repellent, Fen Anti-Mildew and Fen-Aseptic, a combination of both. Write us.



Don't decide on any water repellent until you read what an independent testing laboratory found out about the remarkable results achieved with FEN. "Take a Lesson from the Mermaid" is a folder summarizing these results. Write for a copy.

FEN WATER REPELLENT is a one-bath treatment for stain and water repellency fully meeting government specifications for a wide variety of fabrics including:

- Canvas for leggings
- Webbings for cartridge belts
- Wool overcoating 32-oz.
- Twills for tents, mineral khaki
- Uniform twill
- Rayon cordage and parachutes
- Wind Resistant twill or poplin
- Rayon and cotton twill
- Cotton duck for case covers
- Duck or twill for bedding
- Wool covert dark blue 12 oz.
- Cotton or acetate sleeping bags
- Mackinaw fabric
- Lightweight khaki cloth
- Uniform twill
- Herringbone twill

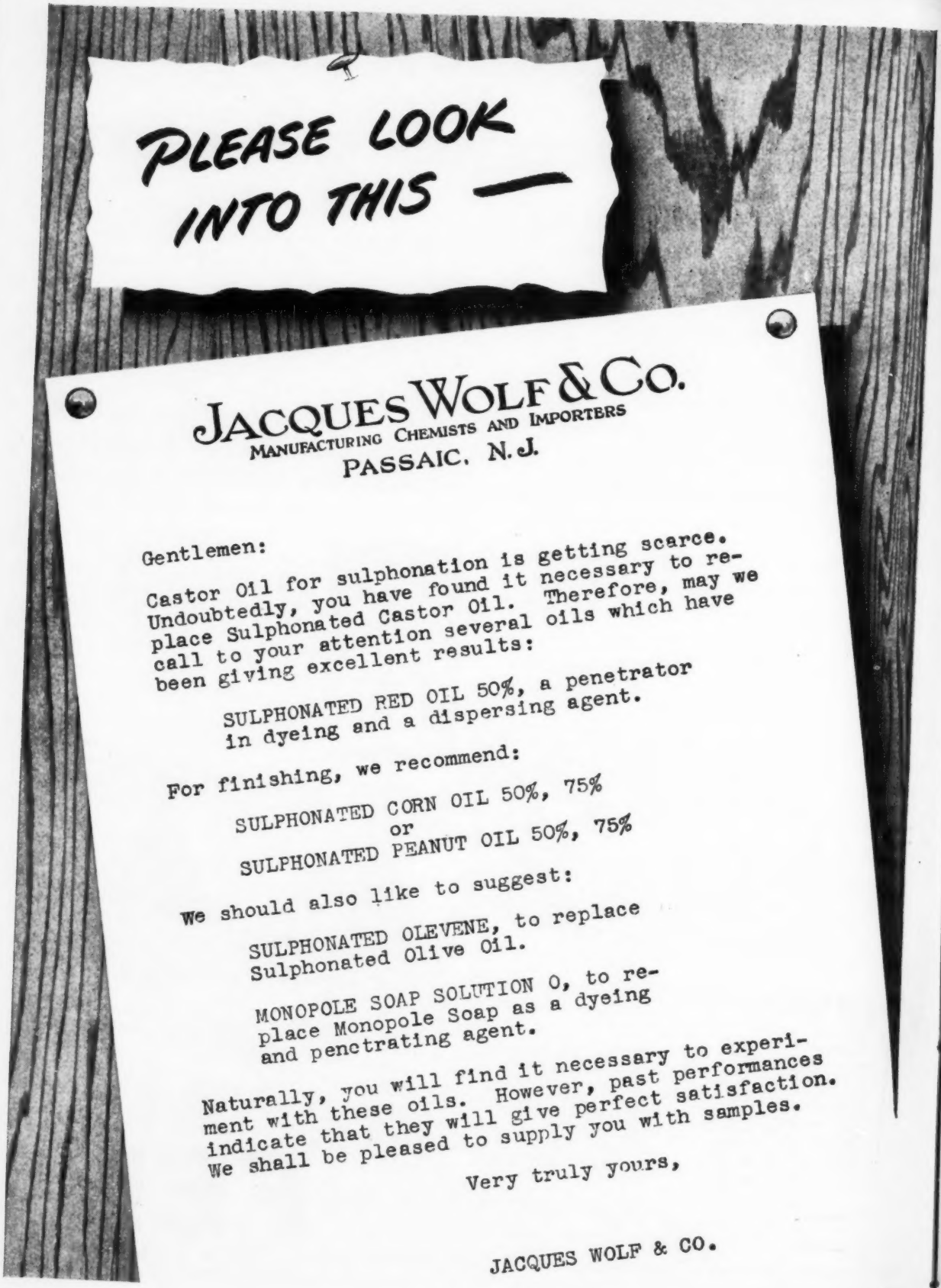


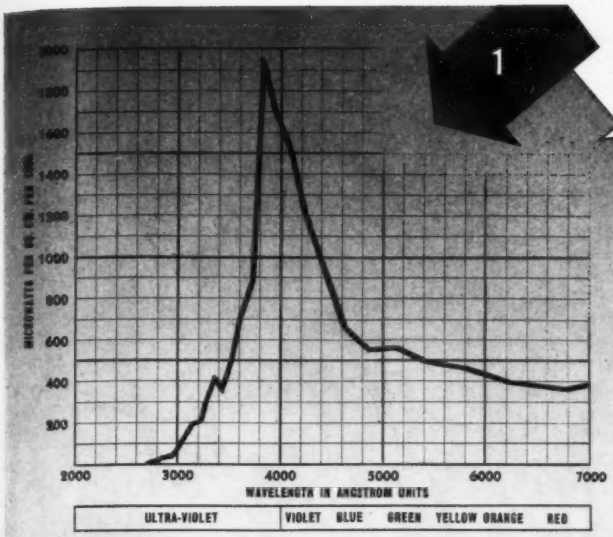
FEN-ASEPTIC is a non-toxic one-bath treatment combining water repellency and mildew-proofing. Now being used for fabrics such as:

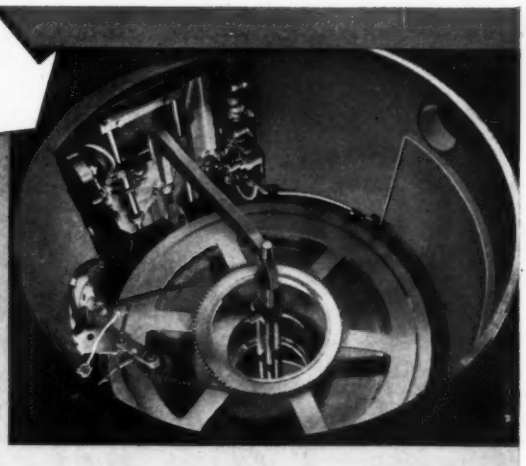
- Ducks and twills for shelter tents
- Barracks bags
- Uniform twill
- Cotton cloth
- Cotton sleeping bags
- Duck netting and hammocks
- Mosquito bars

FEN

Amalgamated Chemical Corp., Philadelphia, Pa. Southern Representative: Robt. A. Bruce, P. O. Box 35, Greensboro, N. C. : : Makers of a complete line of Textile Finishes, Dyeing Agents, Penetrants and Softeners.


PLEASE LOOK INTO THIS —
JACQUES WOLF & Co.
MANUFACTURING CHEMISTS AND IMPORTERS
PASSAIC, N. J.
Gentlemen:
Castor Oil for sulphonation is getting scarce. Undoubtedly, you have found it necessary to replace Sulphonated Castor Oil. Therefore, may we call to your attention several oils which have been giving excellent results:
SULPHONATED RED OIL 50%, a penetrator in dyeing and a dispersing agent.
For finishing, we recommend:
SULPHONATED CORN OIL 50%, 75%
or
SULPHONATED PEANUT OIL 50%, 75%
We should also like to suggest:
SULPHONATED OLEVENE, to replace Sulphonated Olive Oil.
MONOPOLE SOAP SOLUTION O, to replace Monopole Soap as a dyeing and penctrating agent.
Naturally, you will find it necessary to experiment with these oils. However, past performances indicate that they will give perfect satisfaction. We shall be pleased to supply you with samples.
Very truly yours,
JACQUES WOLF & CO.





Two of Many Reasons Why

The National Type XV Unit is in Demand for Accelerated Fading of Dyed Fabrics . . .

TRADE-MARK

1 TYPE OF LIGHT SOURCE. This accelerated fading machine utilizes the flame type carbon arc burning "National" *Sunshine* carbons. This arc provides radiation recognized as the closest approach to the full spectrum of natural sunlight available from any light source of suitable intensity. The spectral energy distribution curve above shows the similarity of radiation from this arc to natural sunlight, especially in those regions of the spectrum most important in the fading of colored materials.

2 METHOD OF MAINTAINING LIGHT INTENSITY. Arc wattage, upon which quality and uniformity of radiation depend, is closely regulated in the XV unit by the most accurate method of arc control. This consists of a mechanism built around a reversible motor governed by a solenoid operated relay. Deviation from the selected current value is never more than a fraction of one ampere. This type of arc control is used on carbon arc lamps designed for the most exacting constancy of energy output, such as therapeutic applications, irradiation for production of Vitamin D and others.

SCIENTIFICALLY DESIGNED TO PERFORM THESE 4 FUNCTIONS

1. To duplicate the fading effects produced by exposure to natural sunlight. 2. To accelerate fading action. 3. To accurately control test conditions and permit their reproduction at any time, independent of weather or season. 4. To operate continuously for a 24 hour period.

NEW DESCRIPTIVE BULLETIN. Gentlemen: Please send me your new literature on the "National" Type XV Accelerated Fading Unit.

Name_____ Position_____

Address_____

The National

TRADE-MARK

TYPE XV ACCELERATED FADING UNIT

NATIONAL CARBON COMPANY, INC.

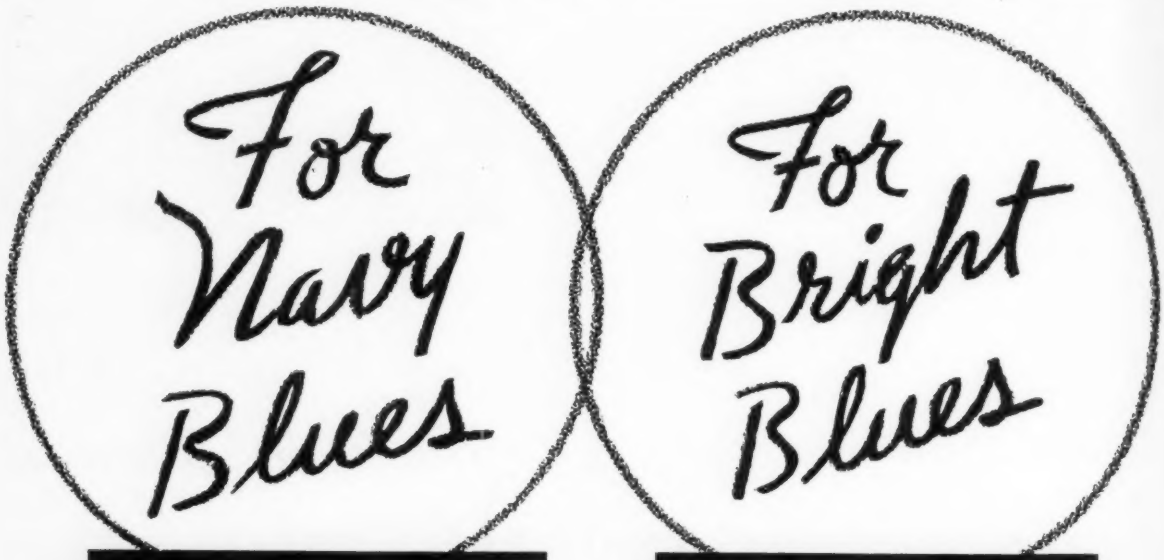
Unit of Union Carbide and Carbon Corporation

UCC

CARBON SALES DIVISION, CLEVELAND, OHIO

General Offices: 30 East 42nd St., New York, N. Y.

Branch Sales Offices: New York, Pittsburgh, Chicago, St. Louis, San Francisco



Pharmasols

Blue GNXX
Blue GDNN

THESE azoic colors, for printing cotton, linen or rayon, produce Navy Blue of good fastness at a low cost. In combination with the Pharmasol Yellows they produce deep Browns.

PHARMASOLS are stabilized solutions, adjusted to the most practical concentration, which can be easily applied with a maximum of efficiency.

PHARMASOLS do not decompose and thereby they overcome the otherwise problems of troublesome dissolving.

Indigosol

BLUE IBC

THE outstanding soluble vat color for producing bright Blues in any depth, of excellent fastness, is Indigosol Blue IBC. It is suitable for dyeing, padding and printing on cotton, linen or rayon (excepting acetate fibres) where maximum fastness is required.

Indigosol Blue IBC is an important member of the group of very fast Indigosols, all of which are readily soluble and easily developed.

CARBIC COLOR AND CHEMICAL CO., INC.

451-453 Washington Street, New York City

BRANCHES:
PHILADELPHIA
PROVIDENCE HAMILTON, ONT.
CHARLOTTE, N. C.

IMPORTERS OF THE MANUFACTURES OF
DURAND & HUGUENIN S. A.
BASEL, SWITZERLAND

EXCLUSIVE DISTRIBUTORS OF
PHARMASOLS
PHARMOLS
PHARMACINES

Representative: Los Angeles (Hathaway Allied Products)

AMERICAN DYESTUFF REPORTER

A. P. HOWES
Publisher

LOUIS A. OLNEY, D.Sc.
Directing Editor

NORMAN A. JOHNSON, B.T.C.
Managing Editor

MYRON D. REESER
Advertising Manager

Official Publication of the Proceedings of the American Association of Textile Chemists and Colorists

MARCH 1, 1943

VOLUME 32 NUMBER 5

American Dyestuff Reporter, Vol. 32, No. 5, Mar. 1, 1943. Published every other Monday. Copyright, 1943, by Howes Publishing Co., 440 4th Ave., New York, N. Y. Domestic subscription, $5.00, Canadian, $6.00, Foreign, $6.00. Entered as second-class matter, Nov. 6, 1919, at the New York, N. Y., Post Office, under the act of March 3, 1879.

Contents

Contents of previous issues can be found by consulting the Industrial Arts Index at your library

• Special Articles

Chemically Modified Wools of Enhanced Stability..... 99
Walton B. Geiger, F. F. Kobayashi and Milton Harris

Dyeing to Government Specifications with Sulfur Colors. 109

War Standard Coordinates Systems for Specifying and Describing Color 118

How to Estimate the Dollar Value of Heat You are Wasting 120
W. F. Schaphorst

• Departments

Trade Notes—New Products..... 114

• Proceedings of the American Association of Textile Chemists and Colorists

Continuous Indigo Dyeing on Woolen Piece Goods (Discussion) P106
Geo. O. Linberg

Meeting, New York Section..... P107

One Hundred and Thirty-third Meeting of the Research Committee P107

Meeting, Mid-West Section..... P107

Calendar of Coming Events..... P108

Copyright, 1943, Howes Publishing Co., Inc.

AN EXPLANATION

. . . that needs no apology!

To all our friends who have been unable to secure Nacconol NR readily during the past few months, we feel that an explanation is due!

Nacconol NR — the leading synthetic organic detergent — is being used in ever-increasing quantities by both the Army and Navy:

In Salt Water Soap (replacing cocoanut oil types)
For Army Mobile Laundries
In Camouflage Paints
In Synthetic Rubber and Explosives,
and in other vital war necessities.

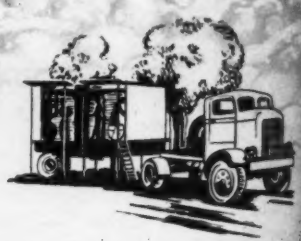
Nacconol NR production has been increased many fold and we are doing everything possible to meet the unprecedented demand. Meanwhile, we ask that you bear with us if we are unable to take care of your needs as promptly as heretofore.

Like many other products, Nacconol NR has "gone to war" in a big way to help hasten the day of complete and final Victory!

SHIPBOARD LAUNDRIES

SYNTHETIC RUBBER

CAMOUFLAGE AND EXPLOSIVES



MOBILE LAUNDRIES

NATIONAL ANILINE DIVISION
ALLIED CHEMICAL & DYE CORPORATION
40 RECTOR STREET NEW YORK, N. Y.

BOSTON PHILADELPHIA GREENSBORO CHATTANOOGA
PROVIDENCE SAN FRANCISCO ATLANTA PORTLAND, ORE.
CHICAGO CHARLOTTE NEW ORLEANS TORONTO

AMERICAN
DYESTUFF REPORTER

VOLUME 32 MARCH 1, 1943 NUMBER 5

CHEMICALLY MODIFIED WOOLS OF ENHANCED STABILITY

WALTON B. GEIGER, F. F. KOBAYASHI, and MILTON HARRIS*

Research Narrative

The tendency of wool to be eaten by moths and to be damaged by laundering can be considerably diminished by a process developed by Research Associates of the Textile Foundation at the National Bureau of Standards. The process is based upon a previously observed fact: the sulfur of the wool is generally the first point attacked by the digestive juices of moths, by the alkali of soap, and by many other chemicals. Through transforming the chemical linkages of the wool that involve sulfur to more stable ones, wools that moths cannot digest, and that are several times as resistant to damage by alkali, laundering, and other processes have been developed. Also, neither the softness nor the strength of the wools is impaired.

The improved resistance of the new wools to damage by moths and by alkali should be of value in such common uses as clothing, blankets, and carpets. The generally improved resistance of the wools should also increase their value in certain industrial applications, such as in the wool felts used by papermakers, which are exposed to harmful chemicals that the new wool resists.

RECENT work in this laboratory has shown that the disulfide cross-linkages of wool can be transformed to more stable *bis*-thioether linkages by a two-step process. The disulfide groups are first reduced to sulfhydryl groups by means of a mercaptan, and then, by treating the wool with an aliphatic dihalide, a pair of sulfur atoms are linked together through short hydrocarbon chains. Wools modified by such a process have now been studied more extensively. It was found that they are decidedly more stable than wool toward many chemical agents, including alkalies, acids, oxidizing agents, reducing agents, and staining by metals, and also toward certain biological agents, including moths, carpet beetles, and enzymes.

I. INTRODUCTION

One of the greatest practical disadvantages of wool has been that it is only moderately stabile to a number of chemical agents, especially those that primarily attack the disulfide group of the cystine of the wool. For example, the degradation of wool by alkalies[1], by oxidizing agents such as peroxide[2] or chlorine[3], or by reducing agents such as the bisulfites or dithionites†[4], has been shown to result in part at least from the breakdown of these groups. Damage to wool by light also involves the breakdown of disulfide groups[5]. In addition, rupture of these groups seems to be involved when moths attack wool[6], and also is necessary before enzymes can digest it[7]. Yet disulfide groups are of primary importance in maintaining the unusual mechanical properties of wool, particularly its elasticity[8], since they serve as cross-links between the peptide chains of the wool protein[9]. For these reasons there would seem to be an obvious advantage in transforming the disulfide groups to more stable ones through a process not deleterious to the mechanical properties of the wool.

Recent work in this laboratory[9] has led to the development of a series of chemical reactions by which this can be done. By treating the wool with a solution of thioglycolic acid or other mercaptan at a pH below 7.0, a portion of its disulfide groups can be reduced to sulfhydryl groups without destroying its fibrous structure, and without detectable changes in other chemical linkages. This reaction may be represented as follows:

$$W\text{—}S\text{—}S\text{—}W + 2HSCH_2COOH \rightarrow 2W\text{—}SH + \begin{matrix} S\text{—}CH_2COOH \\ | \\ S\text{—}CH_2COOH \end{matrix} \qquad (1)$$

where W represents the portions of the wool connected by the disulfide groups. By treating the reduced wool with an alkyl dihalide, the sulfur atoms can be linked through short hydrocarbon chains, and new cross-links that are much more stable than the disulfide groups are produced, as the following equation indicates:

$$2W\text{—}SH + (CH_2)_nX \rightarrow W\text{—}S\text{—}(CH_2)_n\text{—}S\text{—}W + 2HX \qquad (2)$$

where X represents a halogen atom.

*Research Associates of the Textile Foundation at the National Bureau of Standards.

†Also termed hydrosulfites or hyposulfites.

Work already published[3] has demonstrated that wool containing cross-links of this sort possesses enhanced stability to alkali. Since then a greater variety of products has been prepared, and their stability to a wider variety of chemical reagents, and toward moths, molds, and enzymes, has been studied. In addition, a number of improvements in the process for preparing the modified wools have been made, and are described below.

II. EXPERIMENTAL PROCEDURE

1. Materials

The yarn used in the present study was part of the lot used in earlier investigations reported from this laboratory[7,9]. This yarn was a four-ply worsted prepared from raw wool that had been previously extracted with Stoddard solvent and washed with water. The yarn was further purified by extraction with alcohol and with ether for six hours each in a modified Soxhlet apparatus, so constructed that neither hot solvent nor vapor could come in contact with the wool, and finally by washing with distilled water. The cloth used was a plain-woven worsted, of the type described in Commercial Standard CS65-36[10].

2. Methods

a. Reduction

Wool can be reduced, not only with sodium thioglycolate, as in the earlier work[9], but also with other salts of this acid, with the free acid, or with other mercaptans. Comparison of the results obtained with a number of the salts of thioglycolic acid showed that the calcium salt offered unusual advantages, since the products had the best tactile properties, and possessed the greatest stability toward alkali of any studied.

The reduction was carried out by immersing the wool in a solution of calcium thioglycolate at 50° C. and at pH 5. Under these conditions reduction was complete in two hours, while 20 hours was required for reduction by the older procedure.

To reduce about one-sixth of the cystine, 50 ml of a 0.02 *N* solution of calcium thioglycolate was used per gram of wool. To reduce about one-half of the cystine, 20 ml of a 0.3 *N* solution was used per gram of wool. To obtain products in which two-thirds of the cystine had been reduced, two applications of this latter reduction process were required. Products in which five-sixths of the cystine had been reduced were prepared by applying this reduction process four times. When successive reductions were used, each reduction was followed by alkylation.

b. Alkylation

Immediately after reduction, the wool was washed with water, then with 0.01 *N* phosphate buffer at pH 8.0, and again with water. The wool was then immersed in a 0.1 *N* solution of phosphate buffer at a pH value of 8.0 and 50° C., in which the alkylating agent had been suspended with the aid of a cationic wetting agent. About 0.0005 mol of the alkylating agent and 20 ml of the buffer were used for each gram of wool. The nitroprusside test given by the sulfhydryl groups of the reduced wool ordinarily became negative within one hour, but as a precaution the alkylations were continued for a total of two hours.

An investigation of the usefulness of a large group of organic dihalides as alkylating agents showed that they may be grouped roughly into three classes. The first class may be termed satisfactory reagents (those which react with reasonable rapidity and yield very stable products) including methylene bromide, trimethylene bromide, tetramethylene bromide, and 1, 4-dichlorobutene-2. The second class consists of fair reagents (which react more slowly but yield satisfactory products) such as trimethylene chloride, triglycol dichloride, or *bis* (2-chloroethoxy) methane. The third class includes unsatisfactory reagents, such as certain dihalides which are easily hydrolyzed, as benzal chloride and dichloroacetic acid, others with only one sufficiently reactive halogen atom, such as ethylene bromide, 1, 3-dichloropropanol-2, and 2, 2'-dichlorodiethyl ether, and others that produce side reactions, such as styrene dibromide or 1, 3-dibromopropanol-2, which may act as oxidizing agents since the sulfhydryl groups are rapidly converted to the disulfide stage. The results described in this paper are mainly those obtained with one of the best reagents, trimethylene bromide.

c. Analytical methods

The amount of unchanged cystine in the modified wools was determined by the method of Sullivan[11]. The concentration of the solutions of thioglycolic acid was measured by titrating a sample with a 0.05 *N* solution of iodine, using starch as an indicator. Sulfur analyses were made by the oxygen-bomb method[12]. The alkali-solubility was determined by the method of Smith and Harris[2], and represents the percentage of wool dissolved in one hour by 100 times its weight of a 0.1 *N* solution of sodium hydroxide at 65° C.

The breaking strengths of the samples of cloth were determined by the raveled-strip method[10] in the warp direction, with a pendulum-type machine and each value represents the average of at least 10 measurements. The reflectances of the samples of cloth were measured by the method of Reimann and Mease[13].

III. RESULTS AND DISCUSSION

1. Resistance to Alkali

Wool comes in contact with alkali, in processes like laundering and scouring. The action of alkali may diminish the strength and durability of the wool, cause it to turn yellow, and impair its tactile properties, rendering it harsh. Since the linkages of wool protein most susceptible to disruption by alkali are the disulfide groups, transforming them to the more stable *bis*-thioether groups should increase the stability of the wool to alkali. The effect of boiling with dilute alkali upon untreated wool and upon a modified wool is illustrated by photomicrographs of fibers in figure 1. It is apparent that the fibers of untreated wool show far more swelling and disruption than do the fibers of modified wool.

Three other tests for resistance toward alkali were also used: (1) alkali solubility, (2) the extent of yellowing of the products by alkali, and (3) the effect of alkali on

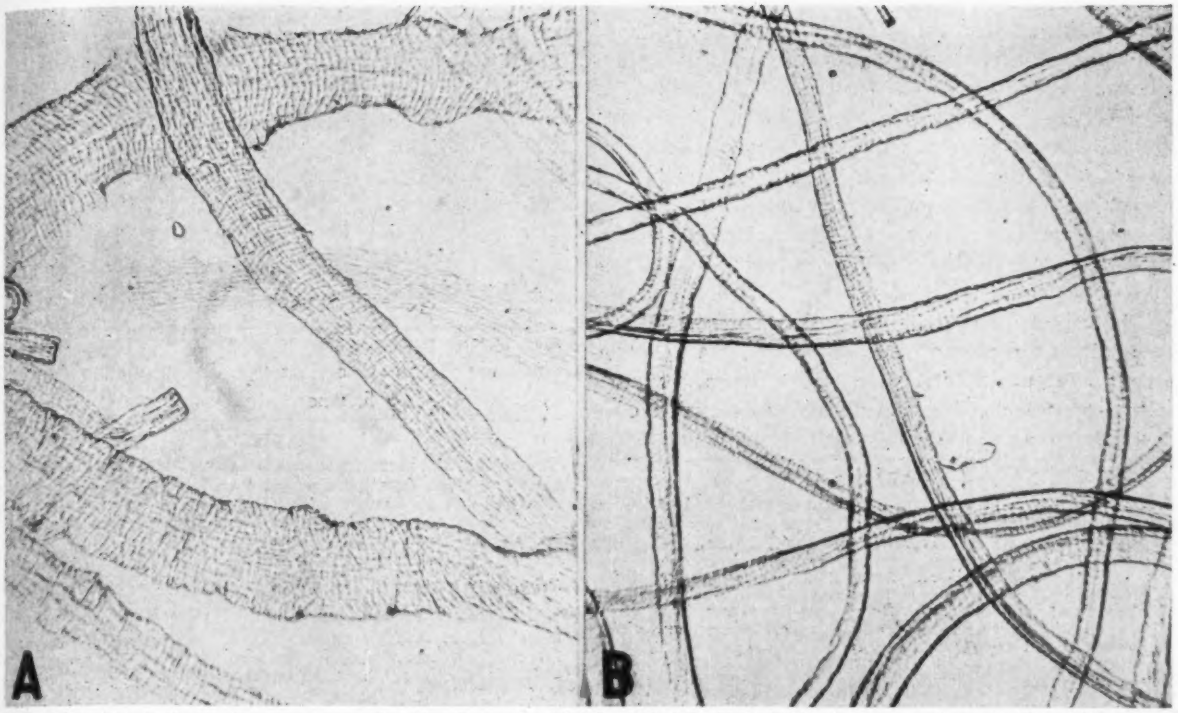


FIGURE 1. Wool fibers after treatment for 30 minutes at 100°C. with 0.01 *N* NaOH. A, untreated wool. B, modified wool (cystine content 6.5 per cent) prepared by reduction with calcium thioglycolate and alkylation with $(CH_2)_3Br_2$. Magnification X 150.

the breaking strength of strips of cloth. The alkali-solubilities given in table 1 show that the modified wools have a decidedly greater resistance than does untreated wool. Closer examination of these data also shows that, although the resistance to alkali increased as the cystine content decreased, little advantage was gained by diminishing the cystine content below 6 per cent. Treatment with boiling solutions of sodium carbonate, which rapidly turns untreated wool yellow, has considerably less effect upon the modified wools, as the reflectance data of table 1 indicate. The loss in reflectance upon treatment with alkali became less as the content of unchanged cystine was diminished. The effect of treatment with boiling solutions of sodium carbonate upon the breaking strengths of strips of wool cloth is also reported in table 1. The loss in breaking strength of the chemically-modified wools upon treatment with sodium carbonate was somewhat less than that of the untreated wool.

TABLE 1

Action of alkalies upon untreated wool and upon modified wools prepared by reduction followed by alkylation with $(CH_2)_3Br_2$. Alkali-solubility of the wools, and their reflectance and breaking strength after boiling for 1 hr. with 0.02 *N* sodium carbonate.

Cystine Per cent	*Alkali-solubility Per cent*	*Reflectance [a] Per cent*	*Breaking strength[b] Before treatment with Na_2CO_3 kg.*	*Breaking strength[b] After treatment with Na_2CO_3 kg.*
		(A) UNTREATED		
12.2	10.0	37.8	14.0	10.0
		(B) MODIFIED		
10.0	6.2	37.6	13.5	11.5
6.5	2.9	41.0	13.5	12.0
4.0	2.5	46.5	12.5	12.0
2.0	2.0	47.5	12.5	11.5

[a] With respect to Mg O.
[b] Strips 2.54 cm. wide, 49 ends.

2. Resistance to Acids

Not only do the modified wools show improved stability to alkali alone, but they also show greater stability to alkali after being treated with acids. Improved stability to such a succession of treatments is important because degradation which may occur when wool is carbonized, acid-dyed, or acid-fulled may be greatly accentuated when the material later comes in contact with alkali, as in laundering. Table 2 illustrates typical results. Because the amounts of soluble nitrogenous materials, which represent partly hydrolyzed protein fragments, that result from each acid treatment are similar for the untreated and the modified wools, it seems likely that about as many peptide chains are hydrolyzed by the acid in one material as in the other, since there is no *a priori* reason for peptide bonds to be stabilized by a reaction involving only the sul-

TABLE 2

Action of acids upon untreated wool, and upon modified wool (cystine content 6.5%) prepared by reduction followed by alkylation with $(CH_2)_3Br_2$.

Conditions	*Alkali-solubility before treatment percent*	*Alkali-solubility after treatment percent*	*N liberated in percent of total N*
Untreated HCl, 0.1*N*, 65°C., 24 hrs...	9.5	20.0	2.0
Modified HCl, 0.1*N*, 65°C., 24 hrs...	2.5	6.3	1.7
Untreated HCl, 0.1*N*, 65°C., 10 days..	9.5	80.0	11.8
Modified HCl, 0.1*N*, 65°C., 10 days..	2.5	45.0	11.3
Untreated H_2SO_4, 0.1*N*, 65°C., 24 hrs..	9.5	28.8	2.9
Modified H_2SO_4, 0.1*N*, 65°C., 24 hrs..	2.5	9.9	2.5

fur. The hydrolytic action of a given acid treatment should therefore result in about the same decrease in average molecular weight for each material. The subsequent alkali-solubility test involves breakdown of the disulfide groups of the unmodified wool but not of the *bis*-thioether groups of the modified wool. For these reasons the greater alkali-solubility of the unmodified wool appears to depend on a decrease in molecular weight that results from the rupture both of disulfide cross-links and of peptide bonds.

The carbonizing of wool with sulfuric acid differs from the above treatments in involving baking at a high-temperature (about 125°C). The results obtained on subjecting untreated and modified wools to a typical commercial carbonizing process are recorded in table 3. The

TABLE 3

Effect of carbonizing with sulfur acid upon untreated and upon modified wool (cystine content 6.5%) prepared by reduction followed by alkylation with $(CH_2)_3Br_2$.

	Alkali-solubility		*Breaking strength**	
	before carbonizing Percent	*after carbonizing Percent*	*before carbonizing Kg*	*after carbonizing Kg*
Untreated	9.5	19.4	13.5	13.5
Modified	3.5	11.0	13.0	13.0

*2.54 cm strips, 49 ends.

untreated wool, after carbonizing, had a high alkali-solubility, so damage might easily result from laundering or other treatments involving alkali. The alkali-solubility of the modified wool after carbonizing had increased too, but the final value was much lower.

3. Resistance to Reducing Agents

Wool is often subjected to the action of reducing agents. For example, wool papermakers' felts frequently come in contact with sulfites. Reducing agents, including dithionites and formaldehyde-sulfoxylates, are used with woo' as stripping agents, and dithionites are also used in dyeing wool with indigoid colors. Such reducing agents tend to make wool extremely susceptible to the action of alkali[4]. Reducing agents appear to attack wool mainly by breaking the disulfide linkages of the cystine. Sodium bisulfite, for example, probably reacts as follows[14]:

$$\text{W-S-S-W} + \text{NaHSO}_3 \rightarrow \text{W-S-SO}_3\text{Na} + \text{W-SH}$$

The ionized thiosulfate and mercaptan groups formed by this reaction would be expected to increase the alkali-soluiblity of the wool. The *bis*-thioether linkages of the modified wools cannot, however, react in this way, so such wools should be far more stable to reducing agents. The results obtained by determining the alkali-solubility of both unmodified and modified wools which have been treated with reducing agents are recorded in table 4. The modified wool was found in every case to be considerably less affected by the reducing treatment than was untreated wool.

4. Resistance to Oxidizing Agents

Wool comes in contact with oxidizing agents during bleaching with peroxide, during treatment with chlorine,

TABLE 4

The action of reducing agents upon untreated wool, and upon modified (cystine content 6.5%) prepared by reduction followed by alkylation with $(CH_2)_3Br_2$. For each gram of wool, 100 ml of the indicated reagent was used.

Reagent	*Conditions*	*Alkali-solubility*	
		Untreated Percent	*Modified Percent*
None		10.0	2.5
$NaHSO_3$	1% 100°C. 1 hr.	15.2	4.8
$Na_2S_2O_4$	10% 50°C. 2 hrs.	39.0	4.5
Na_2SO_2-CH_2O	5% 50°C. 2 hrs	13.3	3.7
NaSH	0.2*N* 50°C. 2 hrs.	41.5	3.2

and also in use, through the action of light and air. The effect upon wool of certain chemical oxidizing agents is recorded in table 5, where alkali-solubility is again used

TABLE 5

The action of oxidizing agents upon untreated wool, and upon modified wool (cystine content 6.5%) prepared by reduction followed by alkylation with $(CH_2)_3Br_2$. For each gram of wool, 100 ml. of the indicated reagent was used.

Reagent	*Conditions*	*Alkali-solubility*	
		Untreated Percent	*Modified Percent*
None		10.0	2.5
Cl_2	0.01 *N*, 100°C., 1 hr.	13.6	6.6
H_2O_2	2 vol., 50°C., 1 hr.	15.5	4.0
$KMnO_4$	1%, 35°C., 1 min.	17.5	10.4
$K_2Cr_2O_7$	0.2%, 100°C., 1 hr.	11.0	4.6

as a criterion of damage by the oxidizing agents. The results show that the transformation of disulfide groupings to *bis*-thioether groupings diminishes the deleterious effects of oxidizing agents, since, although the alkali-solubilities of both the modified and the untreated wool have increased, those of the modified wools remain low enough to indicate considerable resistance.

5. Resistance to Staining by Heavy Metals

Wool is easily stained by contact with metals, as by the metal fasteners sometimes used with wool clothing. This staining may possibly result either directly from the reaction of the wool with the metal or from the reaction with oxides or salts formed on the surface of the metal. It was found qualitatively that the extent of staining by solutions of certain salts of iron, silver, copper, and lead was considerably greater with untreated wool than with certain of the modified wools. The results obtained by staining with lead acetate are illustrated in figure 2. The modified wools were stained very much less by a solution of lead acetate than was untreated wool, and the extent of staining decreased as the amount of unchanged cystine decreased. Most of the modified wools studied were similar in this respect, but wool prepared by reduction followed by alkylation with methylene bromide, a process that converts its cystine to djenkolic acid (which contains -S-CH_2-S linkages), was found to be exceptional, since it was stained by lead acetate almost as readily as untreated wool.

6. Resistance to Enzymes, Moths, and Carpet Beetles

Proteolytic enzymes digest untreated wool extensively only after a portion of the disulfide bonds have been broken,

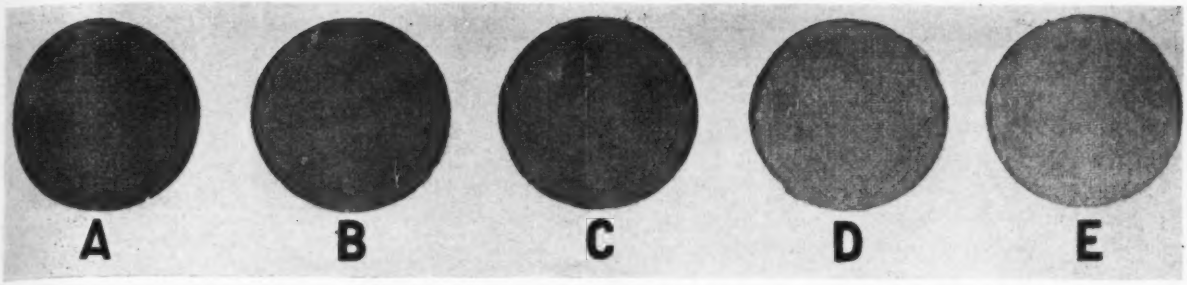


FIGURE 2. Wool fibers after treatment for 30 minutes at 100°C. with 0.02 *N* lead acetate, pH 5.0. Untreated wool, A; modified wools prepared by reduction with calcium thioglycolate and alkylation with $(CH_2)_3Br_2$; B, 10.0% cystine, C, 6.5% cystine, D, 4.0% cystine, E, 2.0% cystine.

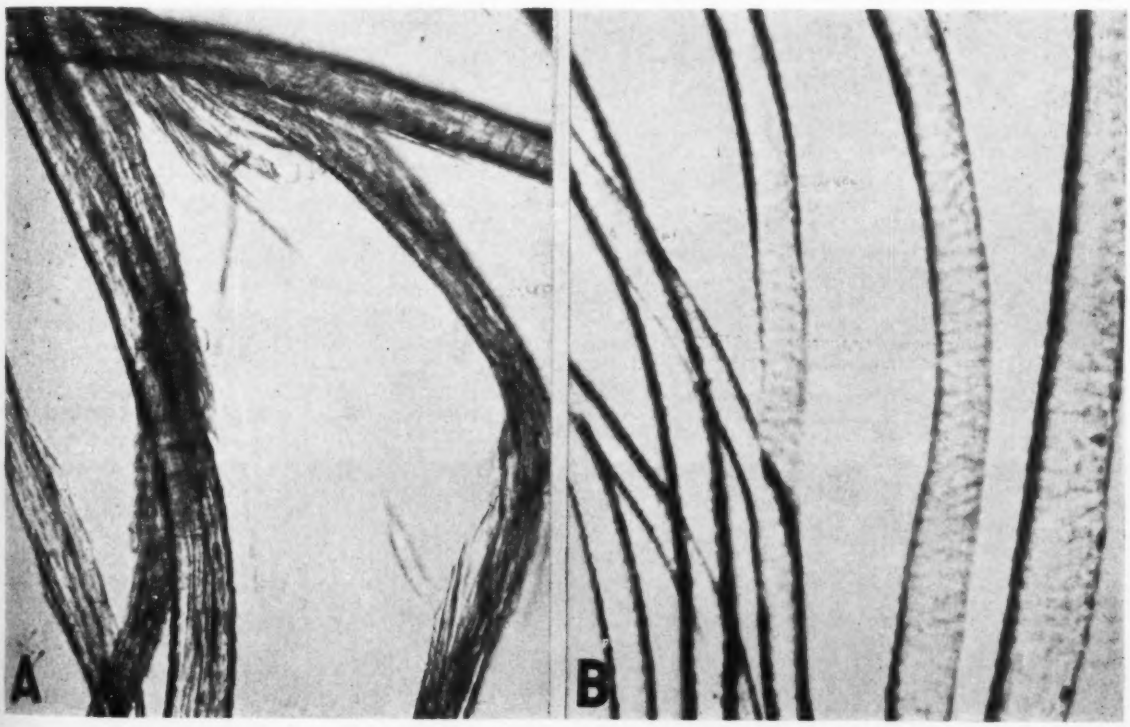
although less complete digestion takes place after mechanical injury or after contact with dilute acid for several days[7]. The wools containing *bis*-thioether cross-linkages showed greatly enhanced resistance to digestion, and were not attacked by pepsin even after mechanical injury, or after treatments with acid sufficient to render untreated wool readily digestible. Photomicrographs illustrating the experimental results are shown in figure 3.

Moth larvae, according to Linderstrom-Lang[6], can digest wool only after breaking its disulfide cross-linkings by the action of a reducing agent present in their intestinal tracts. For this reason it seemed probable that the modified wools containing *bis*-thioether linkages would be far more stable to biological agents than untreated wool, and such stability was actually observed. The new linkages probably interfere with the preliminary reductive step, since *bis*-thioether linkages, as shown above, are very resistant to the action of reducing agents.

A study of the ability of the new cross-linkages to minimize the extent of attack by moths has shown that the modified wools are attacked to a considerably less extent than is untreated wool, and that the resistance increases as the content of unchanged cystine decreases. Table 6 indicates results obtained when wool samples were subjected to the action of moth larvae, and photographs of the actual samples are shown in figure 4*. The modified materials having cystine contents of 6 per cent or less were only slightly attacked, and this attack was mainly

*We wish to thank John A. Levering and J. W. Creely of the Eavenson & Levering Company, Camden, N. J., for the tests with moth larvae, and A. G. Ashcroft and R. C. Allison of Alexander Smith & Sons Carpet Company, Yonkers, N. Y., for the tests with carpet beetles.

FIGURE 3. Wool fibers after treatment with pepsin for 2 weeks[7]. A, untreated wool, B, modified wool (cystine content 6.5%) prepared by reduction with calcium thioglycolate followed by alkylation with $(CH_2)_3Br_2$. Magnification X 150.



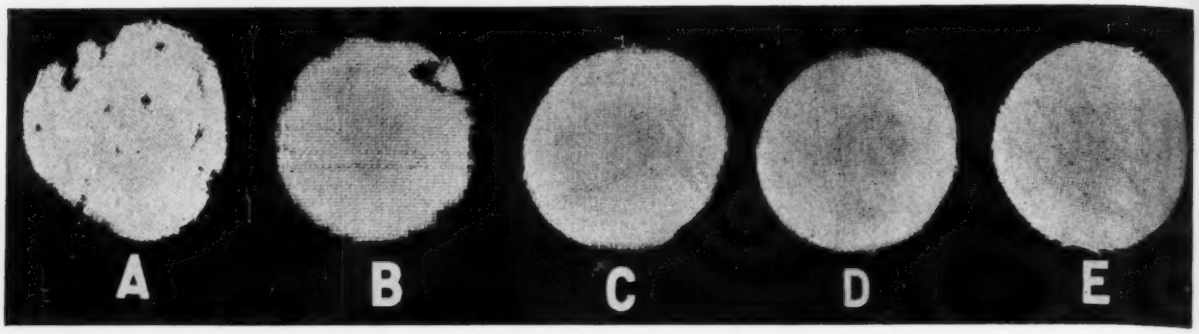


FIGURE 4. Wool samples after subjection to moth larvae. Untreated wool, A; modified wools prepared by reduction with calcium thioglycolate followed by alkylation with $(CH_2)_3Br_2$: B, 10.0% cystine, C, 6.5% cystine, D, 4.0% cystine, E, 2.0% cystine.

around the edges, while numerous holes were eaten into the untreated samples. It also appears that reducing the cystine content to 6 per cent provides about as much protection as the more extensive treatments. It should be pointed out that the mothproofness produced by the present method is not removed by laundering or dry-cleaning, since it is "built into" the molecule as an integral part of its chemical structure.

Carpet beetles were found to damage both the untreated and the modified wools more extensively than did moth larvae, as the data of table 7, and the photographs of figure 5 illustrate. Nevertheless, the modified wools were decidedly more resistant than untreated wool to such attack.

TABLE 6

Action of moth larvae upon untreated and upon chemically modified wools prepared by reduction followed by alkylation with $(CH_2)_3Br_2$. Ten larvae were used for each sample.

Cystine content		*Loss in weight*
Percent		*Percent*
	(A) Untreated	
12.2		15.5
	(B) Modified	
10.0		8.0
6.5		0.3
4.0		2.9
2.0		0.1

TABLE 7

Action of larvae of the black carpet beetle upon untreated and upon modified wools prepared by reduction followed by alkylation with $(CH_2)_3Br_2$. Each sample was exposed to ten larvae for 30 days.

Cystine content		*Wt. of excrement*
Percent		*Mg*
	(A) Untreated	
12.2		52
	(B) Modified	
10.0		45
6.5		21
4.0		34
2.0		23

IV. REFERENCES

[1]J. A. Crowder and M. Harris, J. Research Nat'l Bur. Standards *16*, 475 (1936) RP885; Am. Dyestuff Rptr. *25*, No. 10, 264 (1936).

[2]A. L. Smith and M. Harris, J. Research Nat'l Bur. Standards *16*, 301 (1936) RP875; Am. Dyestuff Rptr. 25, No. 7, 180 (1936).

[3]J. A. Crowder and M. Harris, J. Research Nat'l Bur. Standards *17*, 577 (1936) RP928; Am. Dyestuff Rptr. *25*, No. 14, 383 (1936).

[4]C. S. Lowe, A. C. Lloyd, and A. C. Smith, Am. Dyestuff Rptr. *30*, 81 (1941).

[5]H. A. Rutherford and M. Harris, J. Research Nat'l Bur. Standards *20*, 559 (1938) RP1090; Am. Dyestuff Rptr. *27*, No. 7, 173 (1938).

[6]K. Linderstrom-Lang and F. Duspiva, Z. Physiol. Chem. *237*, 131 (1935).

[7]W. B. Geiger, W. I. Patterson, L. R. Mizell, and M. Harris, J. Research Nat'l Bur. Standards *27*, 459 (1941) RP1433; Am. Dyestuff Rptr. *30*, No. 24, 659 (1941).

[8]M. Harris, L. R. Mozell, and L. Fourt, J. Research Nat'l Bur. Standards *29*, 73 (1942) RP1486; Ind. Eng. Chem. *34*, 833 (1942); Am. Dyestuff Rptr. *31*, No. 16, 376 (1942).

[9]W. I. Patterson, W. B. Geiger, L. R. Mizell, and M. Harris, J. Research Nat'l Bur. Standards *27*, 89 (1941) RP1405; Am. Dyestuff Rptr. *30*, No. 17, 425 (1941); Textile Research *11*, 379 (1941).

[10]Nat'l Bur. Standards Commercial Standard CS59-36 (1936).

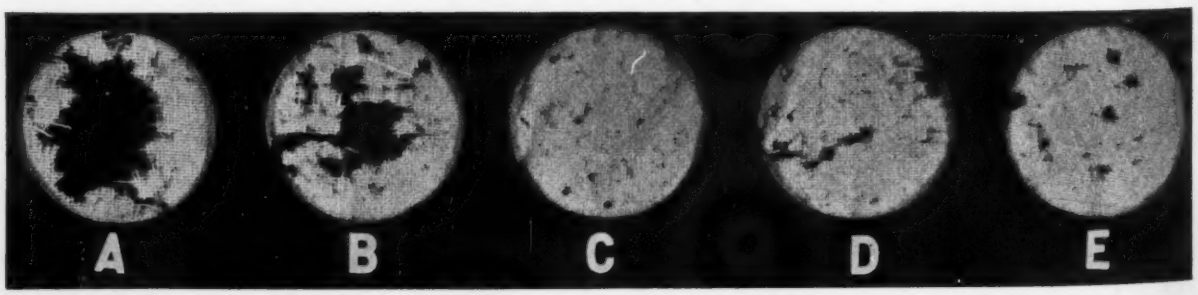
[11]M. X. Sullivan, Public Health Reports 86 (1930).

[12]R. T. Mease, J. Research Nat'l Bur. Standards *13*, 617 (1934) RP731.

[13]G. B. Reimann and R. T. Mease, Nat'l Bur. Standards Letter Circular LC617 (Nov. 8, 1940).

[14]F. F. Elsworth and H. Phillips, Biochem. J. *35*, 135 (1941).

FIGURE 5. Wool samples after subjection to the larvae of black carpet beetles (*Attagenus piceus*). Untreated wool, A; modified wools prepared by reduction with calcium thioglycolate followed by alkylation with $(CH_2)_3Br_2$: B, 10% cystine, C, 6.5% cystine, D, 4.0% cystine, E, 2.0% cystine.



PROCEEDINGS OF THE
American Association of Textile Chemists and Colorists

MARCH 1, 1943

Officers of the Association

THOMAS R. SMITH, *President*
Wiscassett Mills, Albemarle, N. C.

ROLAND E. DERBY—CHARLES A. SEIBERT, *Vice-Presidents*

WILLIAM R. MOORHOUSE, *Treasurer*
National Aniline Division, Allied Chemical & Dye Corp., Boston, Mass.

HAROLD C. CHAPIN, *Secretary*
Lowell Textile Institute, Lowell, Mass.

LOUIS A. OLNEY
President Emeritus and Chairman of the Research Committee
Lowell Textile Institute, Lowell, Mass.

COUNCILORS

Representing Sections

ALLISON R. FLETCHER; BEN VERITY (Rhode Island)
WILLIAM EBERSOLD· ARTHUR E. JONES; JOHN F. McCOY (Philadelphia)
KENNETH H. BARNARD; J. ROBERT BONNAR; J. ERNEST MEILI; GEORGE A. MORAN (New York)
JOHN N. DALTON; HARRY M. HARTNETT; DEXTER R. KNEELAND (N. New England)
THOMAS W. CHURCH; A. HENRY GAEDE (Piedmont)
ROBERT W. PHILIP (South Eastern)
WILLIAM J. HARRISON (South Central)
HERBERT W. TETZLAFF (Midwest)

Past Presidents

ELVIN H. KILLHEFFER; P. J. WOOD; ROBERT E. ROSE;
WILLIAM H. CADY; ALBAN EAVENSON; CARL Z. DRAVES

Local Sections and Their Officers

Northern New England Section

Edward S. Chapin, Chairman, W. C. Durfee Co., Inc., 114 Federal St., Boston, Mass
Azel W. Mack, Secretary, Hart Products Corp., 176 Federal St., Boston, Mass
Delbert E. Ray, Vice-Chairman; George O. Linberg, Treasurer.

Rhode Island Section

Howard V. King, Chairman, 103 Albert Ave., Edgewood, R. I.
Robert W. Joerger, Secretary, Institute Lane, North Scituate, R. I.
Harold B. Sturtevant, Vice-Chairman; Robert R. Farwell, Treasurer.

New York Section

Patrick J. Kennedy, Chairman, E. I. du Pont de Nemours & Co., Inc.
40 Worth St., New York, N. Y.
Norman A. Johnson, Secretary, American Dyestuff Reporter
440 4th Ave., New York, N. Y.
H. W. Stiegler, Vice-Chairman; Edward H. Schmidt, Treasurer

Philadelphia Section

James P. Conaway, Chairman, Delta Finishing Co., Frankford, Philadelphia, Pa
Boyce C. Bond, Secretary, 10 Meredith Road, Overbrook, Philadelphia, Pa.
George E. Kohn, Vice-Chairman; Arthur W. Etchells, Treasurer

Piedmont Section

C. Norris Rabold, Chairman, Union Bleachery, Greenville, S. C.
Leland G. Atkins, Secretary, Southern Dyestuff Corp., Charlotte, N. C.
Henry B. Dixon, Vice-Chairman; Wyss L. Barker, Treasurer

South Central Section

Jack Anderson, Chairman, Peerless Woolen Mills, Rossville, Ga.
Homer Whelchel, Secretary, Central Franklin Process Co., Chattanooga, Tenn.
William J. Harrison, Vice-Chairman; Marvin W. Moore, Treasurer

Midwest Section

Virgil T. Hartquist, Chairman, Wayne Knitting Mills, Fort Wayne, Ind.
Louis Hoehn, Jr., Secretary, Nyanza Color & Chemical Co.,
549 West Randolph St., Chicago, Ill.
George E. Osha, Vice-Chairman; Alfred J. Olson, Treasurer.

South-Eastern Section

John P. Harrison, Chairman, Georgia Kincaid Mills, Griffin, Ga.
Lee L. Baker, Secretary, Tesco Chemical Co., Atlanta, Ga.
O. G. Edwards, Vice-Chairman; George L. Dozier, Treasurer

Lowell Textile Institute Student Chapter

Malcolm Coulman, Chairman; Ralph Bullock, Secretary

North Carolina State College Student Chapter

William R. Ivey, Jr., Chairman; James F. McAlister, Secretary

Philadelphia Textile Institute Student Chapter

F. J. Lorent, Chairman; S. M. Suchecki, Secretary

New Bedford Textile School Student Chapter

Eugene J. Mogilnicki, Chairman; Francis B. Wobecky, Secretary

Members should notify the **Secretary** immediately of all address changes.

Continuous Indigo Dyeing on Woolen Piece Goods*

Geo. O. Linberg

Discussion After Presentation Before R. I. Section, A.A.T.C.C., January 22, 1943

Ques.: What pretreatments are used on the woolen cloth?

Ans.: All pretreatments were abandoned after it was found that higher concentrations simplified the process and gave sufficient depth of shade.

Ques.: Could wetting agents be put on the cloth by padding and drying before entering the dyebath?

Ans.: This was tried, but it was found that the best place for them for dyeing as well as control would be in the dyebath at the beginning.

Ques.: Was scouring the wool goods a necessary preparation for dyeing?

Ans.: The usual fulling and scouring operation employed in woolen mills before dyeing was a regular procedure. In other words the goods were prepared the same way as they would be for piece goods dyeing with either acid or after chrome colors.

Ques.: Were the goods carbonized?

Ans.: The goods were fulled, scoured, carbonized, and neutralized before dyeing.

Ques.: In that case, were not the goods acid on entering the dyebath?

Ans.: In this particular case they were. Completely neutralized goods were also dyed and this necessitated a slight change in the feed formula. To run in this machine satisfactorily it is important, of course, to have the goods uniformly of the same pH before entering the dyebath.

Ques.: What is the pH of the dyebath?

Ans.: pH of 10.8.

Ques.: What is the relative color yield of this process?

Ans.: We can consider on the basis of the amount of indigo used that we get about a 20 per cent dyeing.

Ques.: What is the temperature of the dyebath?

Ans.: It is maintained at 132°F.

Ques.: What is the stability of the dyebath?

Ans.: The 3000 gallon dyebath is kept chemically active by the proper feed and the longest it has been retained was for a 10,000 yard run or about 16 hours continuously. The best results are obtained in running a bath on a strictly continuous basis rather than stopping for several hours and starting anew.

Ques.: How is the feed liquor injected?

Ans.: By gravity feed from the storage tanks through perforated pipes placed at the entrance and also at the center of the dyebath.

Ques.: What is the effect of this alkaline liquor on the strength and width of the fabrics run?

Ans.: There is a small amount of shrinking in going through the machine and in addition to this, the immersion of two three-minute dips at the temperature maintained makes for an increased breaking strength over the white material which enters the bath. There is no question but the increased tensile strength is due primarily to the short immersion at low temperature.

Ques.: What is the method of oxidation on this machine and the padding operation?

Ans.: There are two five-minute air oxidations after each dip on the continuous machine. In the padding operation a chemical oxidation is used such as sodium perborate.

Ques.: How about uniformity throughout the run?

Ans.: In answer to this question the speaker showed patches taken from a normal mill run of hand scoured samples with a patch taken from the first piece and each subsequent fifth piece. They were entirely uniform from beginning to end. On the same card were scoured machine patches which also showed excellent uniformity and a crock test attached showed no coloration.

Ques.: What about the fastness to crocking and light?

Ans.: Many hundreds of thousands of yards have been entirely approved and accepted by the U. S. Navy for all fastness tests. The light fastness exposure to 300 hours shows this method of dyeing of indigo to be at least equal of any U. S. Navy Standard submitted. From a number of tests made it is apparent that a straight dyeing of indigo on this machine shows slightly better light fastness than one bottomed with indigo and then topped with chrome colors.

Ques.: Was the new process suitable for dyeing serges?

Ans.: Yes.

Ques.: What is the difference in the dyeing of flannels and meltons?

Ans.: The bath must be adjusted for the type of material to be dyed, but these differences are not great.

Ques.: Could yarns also be dyed this way?

Ans.: In all probability they could be dyed this way if they were put through a machine of this type in warp form. This would also undoubtedly apply to tops. We, however, are doing practical work on tops at the present time on a much simpler machine using the chemical technique acquired from the continuous machine.

Ques.: Have trials been made with vat colors other than indigo or indigoid type; i.e. the anthraquinone type?

Ans.: What has been said tonight about the continuous dyeing of indigo is but a prelude to the dyeing of wool in the piece form with all classes of vat colors. We are today dyeing mixed fabrics of vegetable and animal fibers continuously with the anthraquinone type of vat colors on a large scale. We have done some work on all worsted fabrics with vat colors of the anthraquinone series that is very encouraging.

*This paper was also presented before a meeting of the New York Section on December 4, 1942, and published in the Proceedings on January 18, 1943.

MEETING, NEW YORK SECTION

THE fourth meeting of the New York Section was held on Friday, January 29th, at the Downtown Athletic Club, New York City. An informal dinner preceded the meeting.

The chairman of the technical program committee called attention to the next meeting, which will be held on March 5th, and which will be devoted to the subject of rayon dyeing and finishing.

Kenneth H. Barnard, national chairman of the intersectional contest program, spoke briefly on the contest which is to be held in the fall in New York.

The technical program consisted of a discussion of the application of resins and plastics to textiles. Speakers were C. W. Patton of the Plastics Division of Carbide and Carbon Chemicals Corp.: "Application of Vinyl Resins and Plastics to Textiles" and W. H. Butler of the Development Laboratory of the Bakelite Corp.: "Phenol Resins and Resin Emulsions and Their Application to Textiles." Samples were displayed.

The attendance was approximately 350.

Respectfully submitted,

NORMAN A. JOHNSON, *Secretary.*

ONE HUNDRED AND THIRTY-THIRD MEETING OF THE RESEARCH COMMITTEE

THE 133rd meeting of the Research Committee followed the Council meeting in Boston on Saturday, January 16, 1943. Present were Chairman Louis A. Olney presiding, H. C. Allen, A. I. Anderson, J. Anderson, W. D. Appel, H. D. Barker, K. H. Barnard, J. R. Bonnar, W. H. Cady, W. G. Chace, H. Christison, R. F. Culver, J. N. Dalton, R. E. Derby, C. Z. Draves, W. C. Durfee, A. R. Fletcher, A. H. Gaede, A. C. Goodings, H. M. Hartnett, A. E. Hirst, N. A. Johnson, D. R. Kneeland, D. P. Knowland, E. D. Lind, J. E. Meili, W. R. Moorhouse, G. A. Moran, H. A. Morrison, F. A. Prisley, R. Robertson, B. A. Ryberg, C. A. Seibert, V. L. Shipp, W. C. Smith, T. R. Smith, F. M. Steadman, F. Tripp, B. Verity, W. von Bergen, R. D. Wells, P. J. Wood, and H. C. Chapin, Secretary. The Chairman outlined plans for publication of a year book as usual in 1943. He reported difficulty in getting spray nozzles and hydrostatic apparatus for testing water resistance of fabrics. Because of Col. W. M. Scott's absence in military service, he appointed Dr. C. Z. Draves Chairman of the Committee on Color and also appointed Edwin I. Sterns, Jr., a member of that committee. He announced that another set of weather exposures of olive drab dyed wool fabrics would be started April 1st if there was enough interest in submission of samples.

Thomas R. Smith reported for the Committee on Ageing of Sulfur Dyed Textiles. Lt. Col. Steadman confirmed the impression that determination of whether or not sulfur dyed goods will deteriorate in storage is the present problem of the Quartermaster Corps. Mr. Knowland confirmed from his own experience an earlier report of the committee that a final rinse with sodium carbonate will prevent such deterioration.

After reporting for the Committee on Mildew Proofing, W. G. Chace resigned because of contemplated entrance to naval service, and was succeeded as Chairman by Dr. H. D. Barker. Mr. Seibert reported for the Committee on Fastness to Dry Cleaning, and Mr. Barnard for the Committee on Standard Methods of Determining Finishing Materials in Textiles. Mr. Ryberg stated that the recommendations of A.S.A. Committee L-14 had been presented to the Federal Trade Commission and were awaiting its action.

W. D. Appel reported on various activities of the Committee on Fastness to Light. He stated that Bureau of Standards C.S.-59 was to be revised to include yarns and possibly unorganized fiber masses; and that reinstatement of our dyed standards would be proposed. Hugh Christison showed a novel method of constructing a series of light fastness standards from blends in various proportions of fibers dyed with two different blues, one very fast, and the other very fugitive.

D. P. Knowland, reporting for his Committee on Fastness to Washing of Dyed Fabrics Composed of Manufactured Organic Fibers, stated that only one of the cotton wash fastness tests would serve for rayon, and proposed new standards and methods which the Research Committee accepted as tentative standards. G. A. Moran reported for the Committee on Wash Fastness Tests for Dyed or Printed Cotton, with particular reference to the efforts of the committee to devise tests equally applicable to both dyed and pigment printed fabrics.

Respectfully submitted,

HAROLD C. CHAPIN, *Secretary.*

MEETING, MID-WEST SECTION

THE annual meeting of the Mid-West Section was held at the Bismarck Hotel, Chicago, Illinois, on Saturday, February 6, 1943.

At 3 P.M. there was a joint meeting presided over by Archie Alexander and Miss Laura E. Pratt, of the Textile Clothing and Related Arts Forum.

Miss Selma Jacobson spoke on "What is the T.C.R.A.F.," and Herman Boxser on the A.A.T.C.C.

L. C. Pfeifle of Sears Roebuck & Co. then delivered a paper on "What the Consumer Seeks from the Textile Manufacturer."

This meeting was attended by 63 members and guests.

Dinner was served at 7:00 P.M. and was attended by seventy-eight members and guests.

The meeting was then called to order by our Chairman, Archie Alexander. The Secretary and Treasurer submitted their reports, which were approved.

The report of the nomination committee was then read by Ed Siegrist, Chairman, who announced that the following had been selected for the coming year:

Chairman, Virgil T. Hartquist; Vice Chairman, George Osha; Treasurer, Alfred Olsen; Secretary, Louis Hoehn, Jr.

Sectional Committee—A. G. Alexander, Herman Boxser, Ed Seigrist, A. T. Brainerd.

National Councilor—Herbert Tetzlaff.

These were elected, and Virgil Hartquist, the new Chairman, addressed the meeting.

On motion of A. T. Brainerd, it was voted that a Spring meeting be held in Milwaukee.

The question of an annual outing was discussed, and referred to a committee.

James Hopwood of the American Viscose Company was then introduced and read a very interesting paper on "Dyeing of Rayon and Kindred Problems."

After this talk, A. G. Alexander showed movies taken at our summer outing.

The meeting was then adjourned at 11:00 P.M.

Respectfully submitted,

LOUIS HOEHN, JR., *Secretary,*
Midwest Section.

CALENDAR OF COMING EVENTS

Meeting, New York Section, Downtown Athletic Club, New York City, March 5, 1943. Speakers: Dr. H. H. Mosher, Onyx Oil & Chemical Co.: "Chemical Finishes for Rayon Fabrics"; Clark Heydon, United Piece Dye Works: "Processing Synthetic Fabrics."

Meeting, Philadelphia Section, March 5, 1943.

Meeting, Piedmont Section, Poinsett Hotel, Greenville, S. C., March 6, 1943. Speakers: Lt. Col. Thomas D. Lewis, Jeffersonville Quartermaster Depot, "The Overall Picture of Dyeing and Finishing as regards Jeffersonville Quartermaster Depot"; Elmer C. Bertolet, Jeffersonville Quartermaster Depot, "The Finishing of Army Ducks with Particular Reference to Mildew-Proofing."

Meeting, Northern New England Section, March 19, 1943.

General Business Meeting (in conjunction with New York Section meeting) April 16, 1943, New York City.

Council and Research Committee Meetings, April 17, 1943, New York City.

APPLICATION BLANKS

for Individual

and Corporate

MEMBERSHIP

may be obtained from

the Secretary

Dr. H. C. Chapin, Lowell Textile Institute, Lowell, Mass.

Dyeing to Government Specifications with

This article which is reprinted from an English publication should prove of value to dyers in this country in view of the current interest in sulfur dyeing.

SULFUR COLORS*

IN DYEING cotton goods to Government Specifications, the sulfur colors are perhaps the most widely used, because so many of the qualities are required in navy blue shades which can only be produced economically with sulfurs. For example, qualities T.500, T.525, T.530, Pattern 11476 (with raised back) and Pattern 11667, are a few of the more important numbers which fall into this category. Interest in this class of dyeing is not, however, confined to blue shades only, and by far the largest yardage of any one cloth ever processed must undoubtedly be Quality T.527, in sulfur drab No. 2. This cloth was formerly done principally in mineral khaki, but is now almost exclusively sulfur dyed. T.527 has recently been substituted by a 2/1 jeanette dyed to the same shade and now known as Pattern 11664. Another number of which big quantities have passed is T.536, a 7-ozs. cotton drill required in a rich cutch brown shade. Then again, sulfur blacks find their use for this work and big quantities of T.561, No. 2 black, which is a 40-in. twill lining, have been and still are being ordered. It will thus be seen that most shades obtainable with sulfur colors find their use in the dyeing of certain cotton piece goods to Government Specifications, and cover a very big number of qualities and fabulous yardages of material.

It would be impossible to attempt to cover in detail the various qualities dyed in sulfur colors, and whilst each quality usually has a distinct shade and a specification of its own, laying down particulars about dyeing, finishing, grey and finished weight, strength tests, etc., the same principles generally apply all-round, and a consideration of some of the principal numbers of different shades will give an indication of the general procedure.

DARKEST OF BLUES

We shall consider first the dyeing of sulfur blue colors of which there are so many different specifications. For quantity of cloth produced to any one specification in a blue shade, T.500 must be the most important number and incidentally is one of the darkest of shades selected by the Ministry for sulfur blues; this quality alone must have made a very heavy call on our dyestuff manufacturing industry.

A comprehensive range of sulfur blue shades has been made available by British color manufacturers, ranging from the sky blues Sulphol Sky Blue G, Sulphol Sky Blue 3G (Robinson) or Thionol Sky Blue FFS, Thionol Sky Blue PS, Thionol Sky Blue 6BS (Imperial Chemical Industries) to the dark navy blue shades, such as Sulphol Indigo Blue B (Robinson) or Thionol Navy Blue R, Thionol Navy Blue XX2B (Imperial Chemical Industries).

PROBLEM OF CONSISTENT SHADE

It is generally found that dyers of sulfur colors are likely to experience more difficulty with blue shades than with other colors—for reasons which will be considered in detail later. Foremost amongst the problems of dyeing sulfur blues is that of obtaining a consistent shade throughout. Many of the sulfur blues change on storage, owing to a very slow oxidation by the air, and the smallest degree of variation in the actual dyeing process or in method of oxidation or in after-treatment on the jigs produces varying tones. Sulfur blues are also apt to give trouble from bronziness and occasionally from dark or red selvedges; certainly they present interesting problems worthy of serious consideration by the processor.

In almost every case the blue is of sufficient depth to dispense with any preliminary bleaching operations. A close singeing is advisable and a light desizing or boil in caustic liquor usually leaves the fabric sufficiently clean to commence dyeing immediately. Dyeing is carried out on the jigs in the usual manner for sulfur colors, with the addition of the requisite quantity of sodium sulfide flakes, according to the strength of dyesuff powder or paste being used. In this connection, the need to be economical with steel drums has led the dyesuff manufacturers to produce this class of color in as concentrated a form as possible, and we thus find that instead of the usual strength product, as illustrated in the old shade books, the same color is now being marketed under the form of 200 strength, or 200 per cent, 300 per cent, or 400 per cent, as the case may be. In such cases, double, treble or four times the amount of sodium sulfide normally advised must be employed.

With bulk runs to one shade, as applies at the present time to most Government orders, the use of the exhaust dye liquors becomes an important method of economy and

*Reprinted from The Dyer and Textile Printer.

in many cases enables the processor to undertake work at a price which otherwise would prove unremunerative. With pale shades, it is generally agreed that the use of exhaust liquors gives rise to more trouble with matching and variation in shade than is justified by the saving in dyestuff, but in the case of blues, the advantage of the saving of valuable dyestuff by this method must be considered. When the shades are produced with single dyestuffs, the use of standing baths does not present much difficulty, providing attention is given to the concentration of sulfide and salt. Unfortunately, most shades are produced with two or more colors, and the amount of replenishment liquor and the rate of feeding during dyeing become rather complicated, as different colors exhaust at different rates. For example, certain sulfur blues do not exhaust as well as others and in order to ensure good results a dyer should make the necessary adjustment in his recipe when working with a standing bath. In practice, this is often difficult, owing to the sometimes minute quantities of shading colors, but when dyeing, for example, a sulfur green with a sulfur yellow (3 parts green, one part yellow), there is approximately 10 per cent difference between the exhaustion of the yellow and that of the green, and in such cases, where a comparatively large amount of color is involved, it is not difficult to adjust the recipe accordingly.

TWO CLASSES OF SULFUR BLUES

Speaking generally, the difficulties of dyeing sulfur blue shades for this type of work are accentuated by the fact that there are two principal classes of sulfur blues, which can be conveniently grouped as follows:—

1. The reducing type, i.e., colors such as Thionol Indigo Blue 2RS (Imperial Chemical Industries), Sulphol Indone RB, Sulphol Indone GR, Sulphol Indone R (Robinson), etc.
2. The direct type of colors, e.g., Thionol Direct Blue RS (Imperial Chemical Industries, Ltd.) (Colour Index No. 956), Sulphol Direct Blue RLS, Sulphol Navy Blue VS. (Robinson).

While the majority of sulfur colors fall into the second or direct group, there are one or two dyestuffs which occupy an intermediate position between the VS and RLS type, such as Thionol Navy Blue XX2B (Imperial Chemical Industries) or Sulphol Blue Black X Conc. (Robinson). It is the fact that sometimes a mixture of two or three colors is necessary to produce a shade, and that they are often either intermediate members or different members of a group, which gives rise to problems in dyeing. This problem of mixing the different types of dyestuff in the same recipe is increased under present conditions because the dyer is frequently compelled to take the nearest colors available from the manufacturer, instead of the exact colors required. In normal times, almost any blue shade could be produced without serious intermingling of different types of colors.

It has already been stated that one of the chief problems to be anticipated in the dyeing of sulfur blues is that of obtaining uniformity of shade throughout the delivery. This difficulty may be attributed generally to the variations (even very slight ones) in procedure with different batches, for example, a few degrees difference in dyeing temperature or in oxidation temperature will produce very marked contrasts in shade. Each jig-man does tend to treat his batches in a slightly different manner, no matter how careful may be the dyer in attempting to ensure that all pieces are treated the same. Further, precisely the same volume of liquor can rarely be applied to two batches of cloth, not ncessarily because of carelessness on the part of the jig-man, but through variations in the sizes or makes of jigs employed in the dyehouse. Also, one does not always find that each jig is running at exactly the same speed, owing perhaps to a slightly different diameter of pulley; some jigs may have two guide rollers, others may only have one big center roller. In work of this type, the jig-man does not usually employ a thermometer, although he should, and it is surprising what differences in temperature there are between one jigger's "boiling" bath and another's.

The customary practice in each dyeing is to add half the liquor solution the first end and the remaining half the second end, followed by two ends with salt, then "bitting." This gives satisfactory results in general practice, but it is not strictly accurate, because in the first run the cloth passes through half the dye and in the second run the cloth passes through half the dye plus the amount left in the bath after the initial run. It is obvious therefore, that slightly more dye should be used for the first run than the second. All these points may in themselves seem trivial, but collectively they have an important bearing on the final results and with sulfur colors the greatest attention to detail is essential for good results.

DANGER OF LISTING

The danger of selvedge marks or listing on sulfur blues must also be watched. It is obviously important that batches be run on the jigs straight, avoiding any overlapping and undue exposure of the selvedges which when containing dye liquor, cool and oxidize more rapidly than the center of the piece, which is protected. In this connection we must not forget that different greys often vary appreciably in width, and it is not uncommon with some maufacturers' cloth to find a difference of ¾-in.-1-in. between two pieces. In such cases no matter how careful may be the jigman in running-on or beaming his cloth, the wider piece or pieces will overlap. In extreme cases of this sort it is advisable for the narrower pieces to be stentered to the width of the broad ones, but in practice when working with a big run, this wastes considerable time and results in unnecessary running and batching up of cloth. Where this difficulty crops up, it is generally feasible to leave any extra wide or extra narrow pieces on one side and work them together as one or two batches towards the end of the run, thus avoiding stentering. Isolated examples must be stentered previous to dyeing to

make a batch of uniform width and even then, after stentering there is always the tendency for the cloth to spring back to its original width. In connection with listing, the problem of using a mixture of two or more different types of sulfur color also arises. The colorless leuco type of dye is soluble in water and the oxidized dye is insoluble; when a considerable excess of sodium sulfide is present, cloth which is carried out of the bath on to the roller is charged with dye liquor rich in leuco dye, which oxidizes slowly, and if any sulfur liquor is squeezed towards the selvedges, it meets conditions favorable for oxidation and cooling and yields the insoluble oxidized dye, which is deposited in the form of selvedge marks.

BRONZING

General bronzing of the shade is usually caused by an over-saturated dye solution or a deficiency of sodium sulfide, and as already mentioned, it is very important to ensure that the requisite quantity of sodium sulfide is used. In the dyeing of particularly dark shades, the dye liquor is often near saturation point and improved results may be obtained by the addition of a little sodium hydrosulfite to the bath. Bronzing is especially liable to occur when working with recovered dye liquors.

After these general remarks, serving as a guide to some of the snags frequently experienced in the dyeing of sulfur blues, we can consider the dyeing of Quality T.500, this being probably the most popular Government cotton cloth in sulfur blue. It is a satinette of a standard type employed by all Government Departments. The cloth is woven 31½ in.-32 in. grey to finish 28 in., and has a weight of 7oz. per lineal yard. Like many Government cloths of this type, it is finished pure and on this account does not present many finishing problems, but it does demand a very high standard of dyeing and absolute freedom from selvedge faults and the like, mentioned above.

The shade for T.500 is a dark rich navy blue erring on the red side and does not require any preliminary bleaching. Because of its weight, the usual practice is to work in batches of about four pieces/100 yards.

The shade can be produced with either of the following recipes:—

4 *pieces*/100 *yds. T.500. Standard.*
10½ lb. Thionol Blue RLS.200
1½ lb. Thionol Black B.200
24 lb. Sodium Sulfide.
4 ends.
4 ends with common salt.
Wash off and oxidize with bichromate and acetic acid.

4 *pieces*/100 *yards. T.500. Standard.*
11¾ lb. Sulphol Blue RLS.200 per cent.
½ lb. Sulphol Black 150 per cent.
¾ lb. Sulphol Prune B.200 per cent.
26 lb. Sodium Sulfide.
4 ends.
4 ends with common salt.
Wash off and oxidize with bichromate and acetic acid.

The above recipes involve shades of sufficient concentration to justify the use of standing baths, but extreme care is necessary in working this way and, as intimated earlier, allowances may be necessary for the different rates of exhaustion of the different colors. Although "bitting" is generally carried out after four ends, employing either of the above recipes, 6-8 ends is necessary in the dye liquor before the required depth of shade is obtained, and immediately the dyer has passed the pattern as being on-shade (the batches being left swinging while any "bitting" is carried out), the goods are given 2-3 washes in running cold water followed by after-treatment with bichromate and acetic acid as an oxidizing agent.

The use of ammonium persulfate, sodium perborate and similar rapid oxidizing agents while frequently adopted for oxidation purposes, is not to be particularly recommended for a heavy blue shade such as the one under consideration, because these products tend to yield their available oxygen too readily, and the tendency is for the ends of the batches to be more oxidized than the center of the pieces and variations in shade in the same batch so result. But in wartime circumstances the processor may have no alternative but to resort to ammonium persulfate or similar products, and for a comparatively heavy fabric such as this T.500, it is necessary to employ an oxidizing agent for the proper development of the shade. Sulfur blacks and certain sulfur dyeings on lighter fabrics can be oxidized satisfactorily with water alone, i.e., 10-12 ends through fresh running waters. With cloths of this weight and upwards, it is exceedingly difficult to remove by constant running waters all the sulfide, and it only tends to cling to the interior of the fabric, thus retarding oxidation. An alternate method of oxidation is the use of ½ per cent of Epsom salt. This is added, after washing the fabric, to a fresh bath and removes the residual sulfide and so promotes oxidation.

INSPECTION AND TESTING

After dyeing, the goods are mangled and dried and are ready for making-up to be passed by the Government Inspector. Occasionally, where narrow, pieces may require a light run through the belt stretcher, but generally the width is correct without stretching.

The following are the official stipulations in regard to inspection, testing, shrinkage, and markings: —

"*Inspection and Testing.* Tests to determine conformity with the figures given in the Schedule will be made under controlled conditions of humidity and temperature. The following standard is prescribed:—

65 per cent to 70 per cent relative humidity at 70 deg. F. The test pieces will be conditioned in this manner for not less than 48 hours prior to test, and tested without removal from these conditions.

The weight of the samples as determined after exposure to these conditions shall be as shown in the Schedule, plus or minus 2½ per cent.

The weight of the goods as delivered shall not exceed the weight under the standard humidity condition by more than 1 per cent.

"*Shrinkage.* Samples for shrinkage tests measuring 20 inches by 20 inches, will be taken. These will be laid flat for 2 hours in cold water and dried on a flat surface at a temperature between 60 deg. and 70 deg. F. Test pieces will be measured, under plate glass, before and after shrinkage. When thus tested, shrinkage shall not exceed 2 per cent either in the warp or in the weft.

"*Marking.* To each piece shall be attached, on both sides, triangular tabs bearing the Contractor's name, the yardage, the description of the material, and such other markings as the contract or order may direct."

DRAB SHADE

We will now consider the dyeing of a drab shade in sulfur colors, a good example being T.527 or Pattern 11664, which is the substitute cloth. T.527 is a 29-in. Florentine drill and finds many uses, such as a lining and pocketing cloth for almost all classes of khaki uniforms. In addition it is used for overalls, lightweight dungarees, trimmings of every description, such as a border cloth for tin helmets to prevent rubbing against the uniform proper, sundry made-up garments, palliasse covers, to mention only a few of its better-known applications. The quantities of this number absorbed by the Government are colossal.

Originally T.527 was specified as a mineral khaki dye, but the use of certain sulfur colors, after-treated in such a manner as to give good fastness, is now permitted and indeed the bulk of this material has of late been processed in this type of color. Like other cloths, the tensile strength test is important and, as a general practice for all Government cloths, it is advisable to subject a grey pattern to the tensile strength test before putting the goods into work, and carefully retaining reference patterns should any serious deficiency be evident when the goods are processed. The weight is required at 5½ oz. per lineal yard, and it is stipulated that the filling of the finished article shall not exceed 5 per cent.

IMPORTANCE OF SINGEING

As most finishers of drills know, the success or failure of a finish on these types depends to a great extent on the initial singeing operation. This not only ensures a prominent twill effect, but also helps to remove any "bittiness." The degree of singeing naturally depends on the quality of yarns used and the particular manufacturer. We have seen deliveries of this cloth so very well made that singeing could almost be dispensed with.

This T.527 shade and a number of other drab shades, as for example numbers T.500 in drab, T.524, 11664, 7313, etc., do not require color to anything like the same extent as the blues previously discussed. T.527 and the others are comparatively light shades, but it is not usually necessary to bleach, and a desizing treatment, followed perhaps by scouring, is all that is necessary before dyeing. With particularly dirty yarns, it may be considered advisable to give a light scouring, and in such cases five or six ends through boiling soap and caustic soda on the jigs serves the purpose. The following is a recipe for the production of this color:—

6 *pieces/100 yds. T.527 Drab No. 2.*
12 oz. Thionol Brown GDR.200
6¾ oz. Thionol Black B.200
8¼ oz. Thionol Yellow Y.200
3 lbs. 6 oz. Sodium Sulfide Conc.
1 oz. Soda Ash.
2 ends at 180 deg. F.
2 ends at 140 deg. F. (with approximately 10 lbs. common salt).

JUSTIFIABLE LOSS

The quantity of dyestuff used, it will be noted, represents only about a 1.5 per cent dyeing, and is such that it does not justify the use of standing baths, this being considered a case where any slight loss in dyestuff is justifiable, as compared with the extra care and time needed in shading, etc., when working with exhaust liquors. Different dyers have their own methods for the washing-off, etc., of this type of shade, but the writer usually "bits" at four ends, and if right, gives one more end through the liquor, three washes off in fresh running cold waters, and then after-treats with the following:—

2-3 per cent Acetic acid (30 per cent).
1½-2 per cent Copper sulfate.
2 per cent Potassium bichromate.

The actual after-treatment varies considerably from dyehouse to dye-house, but we find that the above has given very satisfactory results over the last two years, and no complaints have been received from a fastness point of view.

When after-treating these shades in this way, there is one occurrence which will soon become very evident to the processor, and that is the change in shade, often quite appreciable. It is, of course, the usual practice to subject "bits" to a like after-treatment in a pot or bucket, thus ascertaining as far as possible, what the finished shade will be, but in practice, it is exceedingly difficult to make the two shades correspond. It should be found, however, that consistent results are obtained both with the "bitted" patterns and the finished patterns, providing care is taken in regard to concentration of the bath and the correct temperature.

The obvious difficulty is in matching a new shade where the "bitted" pattern may appear on shade and the goods finish up incorrect. With experience, and in the case of a dyeing to a new shade, it should not be difficult to approach the shade sufficiently near that one or two grams of direct yellow or pink will put the dyeing right, and allowance can be made for this when pitching for the second or third batch. This topping of sulfur colors with even a very small amount of direct color is not a practice to be encouraged and pieces so treated are apt to show up in bulk and can be readily distinguished at a glance.

These goods are not difficult to finish, and the chief points to watch are the width, being 28-in. full, and the weight of 5½ oz. per lineal yard. After drying from mangling, the goods are lightly filled on a two or three bowl

wooden mangle with a little dextrine or farina, on the lines of the following mixing:—

30 lb. Dextrine.
½ gal. Oleine Oil 50 per cent.

Bulk to 40 gals.

The pieces are then damped, allowed to lie and stretched to a full 28-in. This latter operation may be carried out on the ordinary stenter or in some cases on a belt stretcher. The goods are now ready for making-up and passing. They are plaited in yard laps, open fold and usually left in full lumps with the original headings intact.

The counts per inch should be: warp 100 and weft 50. The tensile strength test is usually carried out on a Goodbrand's machine and should give a strength of not less than: warp 420, weft 300, and the filling must not exceed 5 per cent. Patterns tested by the Ministry of Supply are:—

2-in. x 6⅜-in.
4-in. x 6⅝-in.
6⅝-in. x 6⅝-in.

BEST KNOWN SULFUR BROWN

Of the sulfur brown shades, quality T.536 is probably the best-known example and is used for overalls by several Government Departments. The cloth is a 7 ozs., 29-in. cotton drill dyed to a rich cutch brown shade, known as Brown No. 4, and because of its use exclusively for overalls, perhaps the most important requirement is good light and washing fastness. In principle, the processes of singeing, dyeing, finishing and testing remain similar to those for the other drill numbers mentioned. In certain contracts, it is required shrunk finished, but not always.

A good range of bright sulfur brown shades suitable for a shade of this sort has been made available by dyestuff manufacturers. Some of these colors are, however, of very poor light fastness, unless after-treated with the copper-chrome method.

Because of the comparatively large amount of expensive color required in the dyeing of T.536, it is usually advantageous to work with recovered liquor, giving the usual care and attention to the concentration of the bath in regard to both salt and sodium sulfide.

Though the amount of filling is officially limited to 5 per cent because of the fact that all this material is used for overalls of one sort and another, makers-up generally like as firm a finish as possible. The use of a little Epsom salts in the finish, worked in the usual way with, say, Calsolene Oil HS, helps to give the desired weight and retain the necessary handle.

SULFUR BLACKS

Lastly, when dealing with the dyeing of Government numbers in sulfur colors we must not overlook sulfur black shades. Apart from the cotton duck and canvas cloths dyed in black, the principal qualities are the following:—

T519A Cotton Italian No. 1A.
T520 Cotton Italian No. 2.
T521 Cotton Italian No. 3.
T534 Drill No. 4. (Used for aprons, chiefly by the Post Office).
T559 Twill No. 1 Black.
T561 Twill No. 2 Black.
T563 No. 4 Black.
T568 Wadding Black. (Used for padding).

The dyeing of cotton cloths with sulfur blacks is widely practiced and should not present any great difficulty. A comprehensive range of sulfur black colors is available.

The dyestuff and necessary amount of sodium sulfide are made up into a paste with cold water and dissolved by the addition of boiling water. Dyeing is carried out in the usual manner, and for economical working, it is essential to employ the use of standing baths, care being taken to ensure that the density of the standing liquor does not rise too high. The most important duty in dyeing sulfur blacks is to ensure good washing-off, considerably more runs in cold water being required with blacks than with the lighter shades previously discussed. Usually about thirty minutes in fresh running waters is sufficient, but it is not necessary to use bichromate or other oxidizing agents.

Sulfur blacks generally lack depth and richness of shade, in comparison with aniline or logwood blacks, and it is the practice of many dyers to aftertreat the dyeing in such a manner as to improve the shade. For example topping up with a little aniline black is often done, and the following is a suitable recipe:—

4 lb. Aniline Oil.
4½ lb. Spirits of Salts.
9½ lb. Bichromate of Soda.
4½ lb. D.O.V.
31 lb. Iron Liquor.

In making-up the bath, first dissolve the bichromate in a little boiling water and add to the cold water. Next add the iron liquor, then the D.O.V. and then the aniline oil and spirits of salts which have been mixed together in readiness. After the bath has been well stirred, the temperature is raised to 90 deg. C. and a few ends given through this until the desired shade is obtained.

Two other methods of improving the shades are to touch up with basic dyes or logwood extract.

To remove traces of bronziness, which is not uncommon with these colors, sulfur blacks can advantageously be treated with a little ammonia and Turkey red oil, or a soap bath specially prepared with olive oil. Three or four ends through the jig in a lukewarm bath prepared according to one of the following recipes is known greatly to obviate this somewhat undesirable effect:—

(a).

½ pints Ammonia. (.880).
1½ lb. Oleine Oil. (50 per cent by volume.)

50 gals.

(b).

2	lb. Best Quality Soap.
1	lb. Pure Olive Oil.
½	lb. Soda Ash. (99 per cent.).
50	gals.

Qualities T.559, T.561 and T.563 are the biggest numbers and find use for interlinings, pockets and similar applications to that of ordinary black silesia linings. The dyeing of these numbers should not present difficulty, but it is surprising how particular makers-up are in regard to the finish of lining cloths such as these. In accordance with general practice for good quality silesias, it is noted that the standard patterns for Government blacks Nos. 2 and 3, are full beetle-finished.

A good close singeing is important for black silesias, and for cloths of this weight it is not uncommon to give two runs; the goods are then ready for dyeing. After drying from dyeing, the goods are usually stretched and passed to the beetles for about 12-16 hours "slabbing." They are then starched on a two or three bowl wood mangle, stretched again and finished off on the beetles. It should be mentioned that before beetling, it is advisable to give a good spray damping and allow the pieces to lie about twelve hours before running on the beams. This damping before beetling gives a certain sheen which is to be desired for a finish of this type.

In the majority of cases goods dyed with sulfur colors are made-up warehouse-way in the full lump, stamped with the necessary quality number and yardage on the back side of the tab, and are then ready for examination by the Ministry's Inspector, who in turn stamps them when approved with his WD stamp.

TRADE NOTES • NEW PRODUCTS

• EASTMAN ACETATE DYESTUFFS

An outstanding manufacturer of acetate rayon, Tennessee Eastman Corporation, became interested years ago in the possibility of developing improved acetate dyestuffs. After a long period of painstaking reearch, it began the manufacture of acetate dyestuffs at Kingsport, Tennessee, in 1937.

Starting with a few colors, Tennessee Eastman Corporation has gradually enlarged its manufacturing operations until it is now said to offer one of the most complete lines of acetate dyes in the United States. It makes only acetate dyestuffs and sells only colors of its own manufacture. Eastman's research on acetate dyesuffs is closely correlated with its development work on acetate rayon, in order that dyestuffs will be always available for dyeing new types of acetate fabrics.

One unusual color developed by Eastman is Eastone Blue BB. It is claimed that this color has far better resistance to gas fading than anthraquinone blues and has proved very popular on that account. Eastone Blue BB is also said to be one of the very few acetate blues which can be discharged by both screen and roller methods. Eastone Violet B is also a non-anthraquinone color said to possess unusual gas fastness as compared to most acetate violets.

Another very popular Eastman color is Red B, an unusually soluble color which is said to dye well at high or low temperatures and which has been widely used for jig dyeing. Eastman's line of acetate reds and Rubines is said to be considered by the trade to have very good properties as to solubility and fastness to light, washing and crocking. It is stated that Eastone Orange 3R has been widely used for the economical production of various shades of brown on acetate rayon.

Another color recently introduced by Eastman is Navy Blue B. This is a developed color said to possess unusual solubility for dyeing navy blue shades.

At the present time, the line of Eastman Acetate Dyestuffs includes the following colors:

Eastone Red R, Eastone Red B, Eastone Scarlet BG, Eastone Orange 2R, Eastone Orange 3R, Eastone Orange GRN, Eastone Yellow 6GN, Eastone Yellow RN, Eastone Yellow G, Eastone Rubine R, Eastone Rubine C, Eastone Violet B, Eastone Blue BB, Eastman Blue BNN, Eastman Navy Blue B, Eastman Black 2G and Eastman Black SN New.

By concentrating its dyestuff research exclusively on colors for acetate rayon, Eastman believes that over a period of time it will be able to offer a number of new and unusual colors for the dyeing of acetate fabrics. Sales of Eastman Acetate Dyestuffs are handled by Tennessee Eastman Corporation directly from its office at Kingsport, Tennessee.

• A.S.T.M. STANDARDS ON SOAPS AND OTHER DETERGENTS

This special compilation (issued February 1, 1943) of all the specifications, methods of analysis, and definitions developed by Committee D-12 on Soaps and Other Detergents of the American Society for Testing Materials gives all of these standards in their latest form. Committee D-12, with leading technologists representing producers and consumers of soaps and detergents has developed 15 specifications and two methods of analysis for soaps and soap products; seven purchase specifications and four analytical methods for special detergents.

The specifications for soap cover bar, chip, powdered, salt water, solid, toilet, and other kinds of soap, while other standardized specifications apply to the following detergents: soda ash, caustic soda, metasilicate sodium, trisodium phosphate, and others.

To make the first edition of this publication more valuable there are included proposed methods of analysis of industrial metal cleaning compositions, and an extensive anotated bibliography on aluminum cleaning.

Copies of this 140-page publication can be obtained from A.S.T.M. Headquarters, 260 S. Broad St., Philadelphia, Pa., at the following prices: 1 to 9 copies, $1.35 per copy; 10 to 49 copies, $1.10 each.

• SOME TEXTILE WORKERS DEFERRABLE

Following receipt of reports that some workers are leaving textile mills heavily engaged in war work and essential civilian production, Frank L. Walton, Director, Textile, Clothing and Leather Division, met recently with officials of the War Manpower Commission in an effort to clarify the application to the textile industries of the recent order issued by the War Manpower Commission listing certain non-deferrable activities and occupations.

Mr. Walton pointed out that as applied to textile and apparel industries only the following textile activities were listed in the Manpower Commission's order as non-deferrable: curtains, draperies, and bedspreads; pleatings, stitching, tucking and embroidery; trimmings, stamped art goods and art needle work; decorative feathers, plumes and artificial flowers.

Also the following textile occupations are listed as non-deferrable: Custom tailors, custom furriers, and operators of passenger and freight elevators.

The statement was issued to clarify confusion over the terms of the order as to just what textiles were covered by the WMC order.

In addition to representatives from the Manpower Commission, the meeting was attended by representatives of the Army, Navy, the Office of Civilian Supply, and the WPB Labor Production Division.

Those attending the meeting discussed all manpower problems of the textile industry. Both the immediate situation and the long term problem were considered. Mr. Walton indicated that further conferences would be held.

Mr. Walton referred to a release by the Manpower Commission issued recently which listed among essential activities the production of textiles, apparel and leather products.

He quoted from this statement of the Manpower Commission as follows:

"People must be housed and clothed and fed in war time as well as in peace. Essential civilian activities are on an equal plane with the basic war industries in our war effort. Registrants engaged in such essential civilian activities as agriculture, food processing, mining, textiles, transportation, communication, heating, power and educational services are equally protected with respect to occupational classification and dependency status as those engaged in basic war industries."

Mr. Walton explained that this does not necessarily mean that all textile, apparel and leather products will finally be on an essential list, but he said it is hoped that a determination can shortly be made in regard to this problem.

• REINHARDT WHITEWAY SUCCESSOR

War-time successor to Stanley Whiteway, for seven years Advertising Manager of Proctor & Schwartz, Inc., in Philadelphia, is John W. Reinhardt, formerly of the Phila. Suburban Newspapers and the Electric Hose and Rubber Co. Mr. Reinhardt will take over for "the duration" while Mr. Whiteway, who enlisted in a reserve branch of the service last fall, goes on active duty.

• H. H. WILLIS RESIGNS

H. H. Willis has resigned as Dean of Clemson Textile School, which position he has filled for the past fifteen and one-half years. During this time the School has made an enviable record, having grown from an enrollment of some seventy students and four teachers to some three hundred and fifty students and fifteen teachers prior to the present War.

With the co-operation and assistance of the Clemson Textile School staff, Mr. Willis is co-author of seven textbooks on textile subjects ranging from cotton grading through spinning. The preparation of these books was sponsored by The Textile Foundation, Washington, D .C. These textbooks are now being used in textile schools as well as in textile plants which are conducting classes in textiles. Mr. Willis is also author of a number of spinning test reports and technical articles in various textile journals.

Mr. Willis served the Federal Government as Chairman of the Cotton Textile Industrial Relations Board for South Carolina under the N.R.A. dealing with technical and human relation problems in the textile industry. During the past two years he has served as arbiter and advisor on many such problems, in some cases being called by the Federal Government, in other cases by the mill management, by the union, or by management and union jointly.

Mr. Willis plans to devote part of his time to a textile training program in South Carolina which offers guidance and assistance to young men in the textile industry in getting additional training in textiles. He will devote some time to co-operative work in labor relations and technical work in textile plants.

• POLICY, WOOL GROWERS' ASSN.

The policy of the National Wool Growers' Association for 1943 as expressed in resolutions adopted unanimously at the 78th Annual Convention held in Salt Lake City, Utah, January 25th and 26th include:

(1) Continued effort to have the government purchase the 1943 domestic wool clips and all clips thereafter for a period of two years after the first January following a victorious peace treaty.

(2) Endorsement of reasonable and equitable price restriction regulations of the OPA and urgent recommendations that the new administrator, Senator Prentiss Brown, maintain an able, experienced, and unbiased personnel in the legal and commodity branches of the wool section. A further recommendation is made that price control regulations be simplified and that they should not be designed to destroy traditional legitimate methods of business procedure.

(3) Recommendation that the OPA increase ceilings on wool prices in accordance with the amended revisions of the price control act.

(4) Support of the effort being made to obtain lower freight rates on baled wool in order to remove a differential which now exists in favor of foreign wool.

(5) A request that the Government continue to give priority to domestic wool in all Government contracts until each current domestic clip is consumed.

In its recommendations that the Government take over the 1943 domestic clips and those of succeeding years, the resolution requested that this control be maintained until the present enormous strategic stockpile now owned by the Government is disposed of. The association also urged that a monthly survey of the availability of wool supplies be made and that it be used as a basis for determining the feasibility of increasing supplies of wool for civilian purposes. The marketing of the domestic clip under Government control, the association declared, should be handled through the regular channels of trade with the producer selecting his agency, and that provision be made to pay the grower at least 85 per cent of the estimated value of his clip upon delivery to a common carrier or licensed warehouse."

Approval of the price control act was tempered with the statement that there is urgent necessity for a "strong, able, experienced, and unbiased personnel in both the legal and commodity branches of the Wool Section of OPA."

"We further urge Senator Brown that rules and regulations of OPA should be confined to price control and should not require changes in traditional, legitimate methods of business procedure," the resolution declared.

G. N. Winder of Craig, Colorado was elected President of the Association to succeed C. B. Wardlaw of Del Rio, Texas, who was named Honorary President. Vice Presidents elected include Sylvan J. Pauly, Deer Lodge, Montana; Mac Hoke, Pendleton, Oregon; T. C. Bacon, Twin Falls, Idaho; Fred T. Earwood, Sonora, Texas; and Harry J. Devereaux, Rapid City, South Dakota.

• APPOINTED LICENSEES

Atlantic Dye Works, of Paterson, N. J., Fairlawn Finishing Co., Fairlawn, N. J., Farwell Bleachery, Lawrence, Mass., and Glenlyon Print Works, Phillipsdale, R. I., have been appointed finisher licensees under the American Viscose Corporation's "Crown" Tested Plan, being fully qualified to dye and finish rayon fabrics in accordance with the "Crown" Tested minimum requirements, it was anounced recently.

• "OLD SCHOOL TIE" ON WAY OUT

The "old school tie" appears to be on the way out in Britain, at least for the duration, owing to the shortage of dyes and dyeing difficulties caused by the war. The traditional custom in schools and colleges of wearing ties, caps and football sweaters, jerseys and stockings in the individual colors of each school, by which students of one school are identified from those of

another, is disappearing because of the dye situation, and the Board of Trade recently warned that distinctive school and college uniforms would cease, or would at least be modified, until the end of the war. The manufacture of football sweaters and stockings has already been stopped.

No more school caps or hats will be made after May of this year, it is expected, when all hat manufactures will be by license only. There is at present an acute cap and hat shortage but this is expected to be temporarily eased in March when cap makers will release a further quota of head wear.

Headmasters and headmistresses now generally permit new students changing from one school to another to wear the colors of their previous school for their first two terms at the new one, since the students cannot obtain new colors.

● CELANESE PATENTS

Celanese Corporation of America recently was issued two United States Letters Patent—one relating to the delustering of cellulose acetate or other organic derivatives of cellulose textile material and the other to the manufacture of aliphatic compounds, such as ketene and acetic anhydride, by the reaction of carbon monoxide with a lower aliphatic alcohol.

According to Patent No. 2,308,511, cellulose acetate fabric to be delustered is pretreated, with a liquid adapted to shrink the same, while the fabric moves down an inclined plane on which it is caused to gather in folds, whereby the shrinking of the fabric is effected in the absence of tension.

The shrinking liquid is then removed and the treated fabric passed through the air prior to the delustering treatment. This pretreatment is said to avoid the distortion, creasing and rowiness usually found in delustered fabrics due to the softening and plastifying action of the delustering bath.

According to Patent No. 2,308,594, the invention is directed to the use, in such processes, of a phosphoric acid type of catalyst in a particular way and in conjunction with basic nitrogen compounds such as ammonia or organic bases such as amines.

The basic nitrogen compound is preferably present in the substances issuing from the reaction zone and being subjected to condensation.

● MEETINGS, OPTICAL SOCIETY OF AMERICA AND I.S.C.C.

The mid-winter meeting of the Optical Society of America will be held at the Hotel Pennsylvania in New York, New York, on March 5 and 6, 1943. An outline of the program is given below. The Inter-Society Color Council will meet at the Hotel Pennsylvania on Thursday, March 4, for a discussion session in the morning and a business session in the afternoon.

Outline of Program

Friday, March 5

Morning: Symposium of invited papers on "Vision".

"Factors in Human Visual Resolution", by Gordon L. Walls, Bausch & Lomb Optical Company.

"Some Physiological Aspects of the Eye as an Image-Forming Mechanism", by Kenneth N. Ogle, Dartmouth Eye Institute.

"Dark Adaption: Some Physical, Physiological and Clinical Considerations", by Charles Sheard, The Mayo Foundation.

"Some Factors and Implications of Color Constancy", by Harry Helson, Bryn Mawr College and The Foxboro Company.

Afternoon: Contributed papers.

Evening: Informal dinner, followed by a lecture on "Visual Processes and Color Photography", by Ralph M. Evans, Eastman Kodak Company. Mr. Evans will discuss the consequences for color photography of brilliance, constancy, simultaneous contrast, and adaptation-level phenomena. He will demonstrate how these phenomena enter into color processes and what has to be done about them.

Saturday, March 6

Morning: Symposium on Color-Blindness and Color-Blindness Tests (arranged by the Inter-Society Color Council).

"Facts of Color-Blindness", by Deane B. Judd, National Bureau of Standards.

"Methodology of Test Preparation," by Forrest Lee Dimmick, Hobart College.

"The Evolution of Color Vision Test", by Elsie Murray, Cornell University.

"The Red-Green-and-Yellow Equation for Normal and Color-Blind Observers", by Selig Hecht, Simon Schlaar, and James C. Peskin, Columbia University.

"Hue Discrimination Test for Anomalous Color Vision", by David L. MacAdam, Eastman Kodak Company.

"A Method of Testing Color Vision Using Colored Transparencies and Standard Conditions of Observation", by Frederick W. Jobe, Bausch & Lomb Optical Company.

"The Farnsworth-Munsell 100-hue and Dichotomous Tests for Color Vision", by Dean Farnsworth, New York University.

"The ISCC Single Judgment Test for Red-Green Discrimination", by LeGrand H. Hardy, Institute of Ophthalmology.

Afternoon: Contributed papers.

The meeting will be open to non-members as well as members of the Society. All interested persons are cordially invited to attend. Non-members who desire to receive the advance program or other information in regard to the meeting should address their requests to the Secretary, Arthur C. Hardy, Optical Society of America, Massachusetts Institute of Technology, Cambridge, Massachusetts.

● APPOINTED RESEARCH DIRECTOR

Dr. Alphonse Pechukas has been appointed Research Director of the Columbia Chemical Division of the Pittsburgh Plate Glass Company, according to an announcement by Vice President E. T. Asplundh. Dr. Franklin Strain has been named Assistant Research Director of the Division.

Dr. Pechukas, who has been serving as acting director since May, 1942, first entered the Company's chemical division in 1937 as a laboratory research worker.

Born and educated in Chicago, he received the S. B. degree from the University of Chicago in 1934 and Ph. D. in 1937. He is a member of the American Chemical Society and the American Association for the Advancement of Science. Dr. Pechukas is only 28 years old, and hence has the distinction of being among the youngest directors of research in the industrial field.

Dr. Strain received the Ph. D. degree in organic chemistry from the University of Kansas in 1933, and became graduate instructor there. He was later research chemist for Luzier's, Inc., Kansas City, Missouri, and for Behr-Manning Corporation, Troy, New York, before going to the Pittsburgh Plate Glass Company in 1937. He is a member of the American Chemical Society.

● VISCOSE PATENT

The American Viscose Corporation has been assigned Patent No. 2,306,880, relating to a method of dyeing vinyl resin yarn. The patent was awarded to Karl Heymann, a chemist at the corporation's Meadville, Pa., plant, and is described as follows: "A method of dyeing vinyl resin yarn comprising treating the yarn in a dye bath containing a suspension dyestuff in the presence of an organic compound capable of swelling the vinyl resin yarn. The compounds claimed in this patent include benzhydrol, phenylbenzylcarbinol and fluorenyl alcohol."

● AMERCHOL S

A concentrated stabilizing agent for oil in water emulsions used in the rayon and other textile fields has been developed by the American Cholesterol Products, Inc., of Milltown, New Jersey. Known as "Amerchol S," the new agent is said to effectively stabilize emulsions such as produced by various oils in soapy water with very low concentrations. It is stated that only ½ per cent to 2 per cent (of oil content) of "Amerchol S" is normally required.

"Amerchol S" is offered to the textile printer and dyer as a new tool for the

control of dye penetration. It is said to produce unusual effects, such as the uniform dyeing of a fabric containing various types of rayon yarn.

"Amerchol S" is a pale, straw-colored, odorless, semi-solid, non-volatile oil which will not thicken or dry out. It is said to be completely soluble in animal, vegetable and mineral oils, and is readily dispersed in soapy water.

The activity of "Amerchol S" is said to be due to its high content of cholesterol and other free sterols. It is stated that the latter agents have long been recognized as important surface-active materials. However, relative scarcity, high costs, and technical difficulties have prevented their production and use. The development of new methods for large scale production enables "Amerchol S" to be offered at a favorable price to the textile and other industries.

"Amerchol S" is said to facilitate the penetration of lubricants into textile fibers, in addition to stabilizing the oil in water emulsions in which it is used. Thus it is said to assure a rapid, uniform spread of oil, stabilize the lubricant, and allow its removal completely and easily. The colloidal activity of the sterols in "Amerchol S" are responsible for these properties.

Physical and chemical stability is said to be a feature of "Amerchol S" because of the chemical inertness of its components. It is claimed that it is free of acids, alkalies, esters, soaps, amines, glycols and resins. It is further said to be completely unsaponifiable, and will not undergo polymerization. It is also said to be unaffected by acids, alkalies, electrolytes, and oxidizing agents. None of its components have a tendency to develop rancidity, color or odor on standing.

American Cholesterol Products, Inc., is a basic manufacture of Cholesterol C. P., and various purified sterol products, and, it is stated, therefore controls with strict uniformity the manufacture of "Amerchol S" from raw materials to finished product. The organization maintains sales offices at 58 West 40th Street, New York City.

• JOINS WARWICK

Horace Shapiro has recently joined the research department of the Rhode Island Laboratories, Inc., a subsidiary of the Warwick Chemical Company, situated in West Warwick, R. I.

Mr. Shapiro will hold the position of research and development chemist in the field of phosphorescent and fluorescent pigments. He is a graduate of Ohio State University, and for the past two years has been open hearth metallurgist in the Inland Steel Company.

• AIDING MANPOWER PROBLEM

A plan to aid in the solution of the nation's manpower problem by using trained technical men now working but 40 hours a week in consumer industries in vital war industries during evenings and Saturdays when they are not engaged in their regular work, has been developed by W. P. Dooley of the American Viscose Corporation and is now being adopted in a number of industries. Application of a plan of this nature has been recommended by the War Production Board as a means of eliminating production bottlenecks and making available many thousands of highly-trained man hours per week for the intensification of the war effort.

Describing the reasons for the development of the plan, Mr. Dooley states: "An important percentage of the nation's war production comes from localities which are largely engaged in the manufacture of goods for civilian consumption. These concerns employ a considerable number of technical men who are on a 40-hour work week. It seemed apparent that a substantial number of spare hours a week of such individuals could be gainfully used in the war plants in their communities to increase production where and when a labor shortage exists."

In cases where there is no actual labor shortage, Mr. Dooley points out, these engineers and chemists can serve in an advisory capacity to recommend changes in the layout of equipment and in methods which would increase the output.

Regarding compensation of these men, it is suggested that the rate of pay should not be more than that of the regular employee performing the same job. To continue on the job, the special technicians would have to equal the quantity and quality of the output of the regular employee. The wage rate for those who serve in an advisory capacity should not be less than the rate for the highest skilled laborer.

In the interest of national economy and the war effort, payment of compensation, Mr. Dooley suggests, could be made according to the following plan: 5 per cent to the Red Cross or Salvation Army, 10 per cent in U. S. Treasury income tax notes, 35 per cent in cash, and 50 per cent in War Bonds. This method of compensation is offered merely as a suggestion, however, and is not an integral part of the plan.

Utilization of the skill and experience of the thousands of highly-trained men now engaged in consumer industries in the furtherance of the war effort by arranging for these men to work evenings and on Saturdays or Sundays should, according to Mr. Dooley, help materially to alleviate the manpower shortage in a number of vitally important war industries.

EVERYBODY

EVERY PAY DAY

Buy

WAR BONDS!

• DISCUSSION ON M-103

Dr. Arnold L. Lippert, Chief, Dyestuffs Section, Textile, Clothing, and Leather Division, War Production Board, will discuss Dyestuff Conservation Order M-103 at a meeting of the Silk and Rayon Printers and Dyers Association of America on March 19th at the Downtown Athletic Club, 19 West Street, New York City. There will be an informal question and answer period following Dr. Lippert's talk.

The meeting will start at 8:00 P.M. and will be preceded by a dinner at 6:30 P.M. Dinner reservations must be made by noon of March 17th at the association's office, 1450 Broadway, New York City.

• NEW YORK OFFICE

Mixing Equipment Co., Inc., manufacturers of "Lightnin" Propeller Type Mixers, has shifted its New York office from 377 Broadway to 136 Liberty Street. Glenn J. Moorhead, formerly Pittsburgh representative for the company, has assumed the position of Eastern Divisional Sales Manager, with headquarters at the new location. C. F. Donovan will continue his duties as manager at the Liberty Street address.

More spacious and more easily accessible to transportation facilities, the new offices are conveniently located to many of the firms in the New York metropolitan area, which are large users of "Lightnin" Mixers.

The home office of the Mixing Equipment Co., Inc., is located at 1024-1040 Garson Avenue in Rochester, N. Y., where the recently expanded factory is also located.

WAR STANDARD

Coordinates Systems for Specifying and Describing Color*

A NEW color standard which is expected to eliminate much of the existing confusion in matching colors was explained and demonstrated at a conference November 30 under the auspices of the American Standards Association. The conference was attended by the press and by leaders representing a broad section of the industries in which color is an important factor.

The objective of the new American War Standard, Specification and Description of Color, is to reduce to a common language the results of years of technical developments in the measurement of color, so that color can be specified in terms that mean the same to the engraver, to the ink, die, and paint maker, the industrial finisher, the chemist, the printer, the paper and textile manufacturer, and to others interested in color.

PROVIDES COLOR LANGUAGE

During the last few years an accurate language has been available in terms of the physicist but only a relatively small group working in the field of color measurement was familiar with it. The new standard provides a language by which color may be described by means of three basic elements—either by using the physicist's "dominant wave length," "brightness," and "purity"—or by using the psychologists "hue," "value," and "chroma." And the standard makes it possible for us to translate from one system to the other at will.

SPECTROPHOTOMETER IS BASIS

For the new color language, the Standard recognizes the spectrophotometer as the basic instrument for the standardization of color, and the use of material standards (color samples) for the popular identification of color. The spectrophotometer, an instrument of which there are several types, analyzes the color in terms of the percentage of light reflected or transmitted by the color.

Relative to the use of material standards, the new standard states that "The only system of material standards that has been calibrated in terms of the basic specification is represented by the 1929 edition of the Munsell Book of Color, which contains a readily comprehensible system of color samples. The use of this book is recommended wherever applicable to the specification of the color of surfaces. Approximate identification of Munsell hue, value and chroma may be obtained by direct visual comparison with the samples in this Book of Color."

The approved standard thus provides two standards: a fundamental or primary standard, in terms of which any system of color samples can be calibrated; and a secondary or working standard consisting of a series of color samples that have already been calibrated in terms of a fundamental standard, *viz,* the samples in the 1929 Munsell Book of Color.

THREE NUMBERS IDENTIFY COLOR

Either of these two standards makes it possible to identify a color, or to compare two colors, by telegraph, by sending three numbers.

The fundamental standard has the great advantage that it is reproducible at any time and is in nowise dependent upon the permanence of any physical sample. It can thus be used to determine whether a physical sample changes with time. In fact it would make it possible to reproduce any physical sample accidentally destroyed.

The approval of the 1929 Munsell Book of Color as a part of this American War Standard in nowise prevents the approval, as a part of an American Standard system of color, of any other series of color samples that may in the future be calibrated in terms of the fundamental standard. It merely happens that it is the only system that has, as yet, been so calibrated. In fact the calibration of the widely used series of color cards of the Textile Color Card Association in terms of the fundamental color standard is now being put into operation.

The wide adoption and use of the new color specification standard will put color specification on a more scientific and practical basis. It should help eliminate much of the confusion now present in color specification not only for war products but for peacetime products as well.

AIRCRAFT COLORS DIFFICULT TO MATCH

For example, in the aircraft plywood program today a prime contractor may have as many as fifty sub-contractors building wing and tail parts, complete wings, fuselages, etc. Most of these call for camouflage green which is a grayish olive drab, a difficult color to match so that it will be same under all light.

Color chips used by sub-contractors to arrive at this color may vary widely because of deterioration or because the chips were furnished from the standards of different manufacturers. Thus, when the different parts are assembled, there may be a wide variance in color, thus causing a loss of production time if government specifications are to be met.

This same condition applies in industry generally, where an equipment is built by one manufacturer to be integrated

*Reprinted from Industrial Standardization.

with another manufacturer's equipment. There have been many instances where the equipment would have to be refinished so that the color variance would not be noticeable.

The use of the new standard provides a standard specification for all suppliers to meet, thus assuring that parts are of uniform color when assembled.

Color standardization is important in assuring that the color of different batches of equipment or commodities is uniform. A batch might pass visual inspection yet not be uniform in color under all conditions. The variance might not be apparent until units of the different batches are placed alongside each other.

In filling an order in which the spectrophotometric specification is given, the trained colorist will know at once by the monochromatic data the nature of the color required. The finished material will then be checked on the spectrophotometer to match exactly within the given tolerances of the specification.

REFER TO 1929 MUNSELL COLOR BOOK

In applying the new standard to fill an order in which the Munsell notation is given, reference is made by the supplier to the 1929 edition of the Munsell Color Book. He will then match the visual sample indicated. If the specification is given in a Munsell specification not in the 1929 Book, it may be found among the interpolated curves published by the United States Department of Agriculture and in the report of the sub-committee of the Optical Society of America published in the journal of the Society.

In some cases a color name rather than a number is needed to identify a color. This can be done by using the ISCC-NBS system which is based on the Munsell system. It gives 300 and more common color names, selected and defined by means of ranges of the Munsell hue, value, and chroma. The plan of this system was developed by the Inter-Society Color Council, an organization centered around 13 national societies interested in color. The details of the system were worked out at the National Bureau of Standards. The names are simple color names like light green, deep red, and dark brown. To each of such names is assigned, not one single color, but a considerable range of color which accords with its accepted meaning.

HOW AMERICAN FLAG RED IS DETERMINED

The ISCC-NBS name for the standard red of the American flag, for example, would be determined as follows: First, the red in the Munsell color book which corresponds visually to the red in the flag is found. This is Munsell 5 red, 3 value, 14 chroma, written 5R 3/14. The name charts then show that Munsell 5R 3/14 falls within the color range designated *vivid red*. This designation, vivid red, is not exclusive enough for a purchase specification. There are other vivid reds which differ too much from the red of the flag to be acceptable. But the designation, vivid red, gives a fairly graphic idea of the kind of color it is. Although this system is not precise enough for purchase specifications, and is too precise for ordinary conversation or for use in sales promotion, it is being used for the description of drugs and chemicals, and is being introduced into the standard reference books for pharmacists. It is also being used by the U. S. Department of Agriculture for the description of soils, and by the National Bureau of Standards for certain kinds of building stone. It has been recommended for chemistry textbooks on qualitative analysis; and, in short, is useful "wherever general comprehensibility is desired and precision is not important."

SPONSORED BY GENERAL ELECTRIC AND INTERCHEMICAL

The request for approval of the standard for specification and description of color was sponsored jointly by the General Electric Company and the Interchemical Corporation. Both of these companies have devoted a great deal of attention to fundamentals of this standard over a period of years. General Electric pioneered in marketing a commercial model of a recording spectrophotometer invented by Dr. Arthur C. Hardy of the Massachusetts Institute of Technology. This instrument measures color in terms of the wave lengths of the spectral colors. The Interchemical Corporation has pioneered in the use of the recording spectrophotometer to establish color standards for inks, pigments, paints, lacquers, enamels, and other protective and decorative finishes. In 1935 Interchemical published "Three Monographs on Color" which presented the results of a study of color.

During the process of approval of the standard by the American Standards Association the following indicated their approval of the standard:

Agfa Ansco
All Color Company
American Assn. of Textile Chemists and Colorists
American Ceramic Society
American Society for Testing Materials
Assn. of Am. Railroads (Signal Section)
Bausch & Lomb Optical Co.
Congoleum-Nairn, Inc.
Corning Glass Works
Dow Chemical Company
Eastman Kodak Company
Electrical Testing Laboratories
General Electric Company
The Glidden Company
Illuminating Engineering Society
Interchemical Corporation
Inter-Society Color Council
Limited Price Variety Stores Assn.
Mail Order Assn. of America
Munsell Color Company
National Bureau of Standards
Nat. Electrical Mfrs. Assn.
Nat. Formulary of the American Pharmaceutical Assn.
Office of Production Management
Optical Society of America
RCA Manufacturing Company
Alexander Smith & Sons Co.
Technicolor Motion Picture Corp.
U. S. Bureau of Printing and Engraving
U. S. Department of Agriculture
U. S. Navy Department
U. S. Pharmacopoeial Convention
Westinghouse Electric and Mfg. Co.

The standard is being used by the National Bureau of Standards and the Department of Agriculture in their regular testing work.

The conference at which the color standard was demonstrated was presided over by R. E. Zimmerman, vice-president of the United States Steel Corporation and president of the American Standards Association. Speakers on the program were Dr. Arthur C. Hardy, Professor of Optics at the Massachusetts Institute of Technology; Dr. Deane B. Judd, National Bureau of Standards; Dr. Loyd Jones of Eastman Kodak Company; Lt. Col. Frank M. Steadman of the Quartermaster Depot in Philadelphia; A. Wallace Chauncey, vice-president, Interchemical Com-

pany; and E. S. Lee, Director of General Engineering Laboratories, General Electric Company.

In connection with the luncheon there was a color exhibit to illustrate how many industrial organizations are now using the standard. A General Electric Recording Spectrophotometer was in operation. The exhibits also showed the application of both spectrophotometry and the Munsell notation. A motion picture was shown which graphically illustrated the fundamentals of color analysis in layman's language.

HOW TO ESTIMATE THE DOLLAR VALUE OF HEAT YOU ARE WASTING

W. F. SCHAPHORST

ARE you allowing heat to go to waste? Water? Other liquid? Air? Solids? In quantities? If so it might be worth while to check up and determine the value of the recoverable heat in dollars. Such checking is usually possible.

For example, if you are wasting hot water, its heat content can very likely be saved and utilized by installing a heat exchanger. You may not want to keep the waste water itself for various reasons, but, regardless of its possible impurity it is generally possible to save the heat in that water by transferring it to water that *is* clean and pure.

When computing the value of hot waste one of the simplest rules to keep in mind is this: For every degree increase in water temperature absorbed from the waste water or gas or solid you have the equivalent of one heat unit saved.

To make the method of computing perfectly clear, let us say that you have succeeded in raising the temperature of 12,000 gallons of water per hour, by means of an exchanger, from a temperature of 40° F. to 100° F., or an increase of 70° F. For each pound of water, therefore, 70 heat units are saved. Since one gallon of water weighs 8-1/3 pounds we have a total of 100,000 lbs. of water per hour or one million pounds of water during a ten-hour day. This means that 70,000,000 heat units are being saved per day. Now, taking into consideration the heat value of coal and the efficiency of the boiler we can say, roughly, that the saving of 10,000 heat units is equivalent to the saving of one pound of coal. For many boilers this figure is too high, but when compared with the average boiler it is well on the safe side, so let us be conservative and use 10,000. Dividing 10,000 into 70,000,000 we get 7,000 pounds of coal saved per day, or 3½ tons. At $5 per ton, the saving is therefore $17.50 per day. And if you operate 300 days per year the total annual saving will amount to $5,250. If you operate 24 hours per day the yearly saving will be considerably greater than that, but we are being conservative.

$5,250 will very likely more than pay for the heat exchanger. In view of figures that I have before me a very high grade of exchanger can be had for $4,600 and according to its manufacturer the annual saving resulting from its use will amount to some figure between $7,000 and $9,320 when based on $3 coal. So, obviously, our figures as given in the computation above are not exaggerated in the least.

To be sure these figures may not fit your own special conditions at all. But I have given the method of computation in detail so that you can supply your own values based in your own conditions and then figure it out yourself. You will soon be able to decide whether or not it will pay you to install a heat exchanger. Personally, I am quite enthusiastic about exchangers, not only because they save money but because they save that most valuable of all earthly substances—fuel.

•CLASSIFIED•

POSITION WANTED: Cotton and rayon yarn dyer with 20 years experience. Familiar with various types of skein dyeing machinery and an expert on package dyeing. Good knowledge of fast colors. Past record will show capabilities in handling large production. Write Box No. 420.

WANTED: Graduate chemist—dyer for rayon dyehouse with good all-round experience in dyeing and finishing silk, rayon and acetate piece goods. Must possess executive ability. Write Box No. 422.

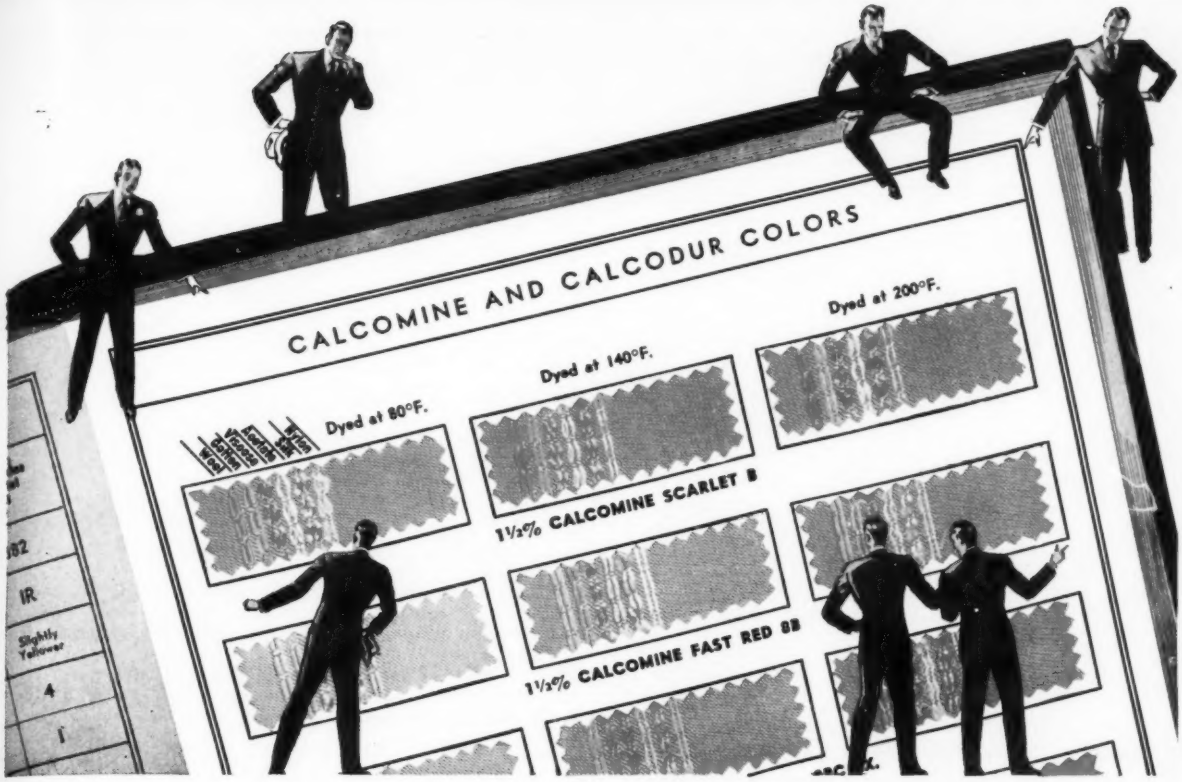
WANTED: Dyer familiar with dyeing rayon and acetate fabrics on jigs. Give full details of experience. Write Box No. 423.

WANTED: Hosiery Dyer and Finisher. Familiar with all types of fabrics. Must be able to supervise Boarding, Inspecting, Packing, etc. Also take charge of all maintenance in plant. State education, experience, draft status and salary expected. Write Box No. 424.

WANTED: Textile chemist-analyst, male or female. Routine chemical and dyestuff testing. Good opportunity for right person. State education, experience, draft status, and salary expected. Write Box No. 425.

WANTED: Research Chemist, preferably with experience in textiles and resins, for essential work. Write Box No. 426.

POSITION WANTED: Boss Dyer and Chemist. Twenty-five years laboratory and practical experience on cotton, rayon, Celanese skeins, piece goods and mixed fibers, using all classes of dyes. Capable, efficient, good references. American, married, draft exempt. Will go anywhere. Available at once. Write Box No. 427.



What every colorist wants to know about Viscose Rayon

How will rayon's individual characteristics affect the direct dyeing of fabrics? Further, with the tremendous, war-spurred use of rayon *mixtures,* what will be their behavior in the dye-bath?

Here at Calco, our chemists have made a thorough study of the behavior of dyes on this fiber. And their findings are summarized in the newly published Calco Shade Card, "Direct Colors on Viscose Rayon."

This volume shows the exact shades of Calco direct dyes upon viscose rayon piece goods containing floaters of cotton, wool, viscose rayon, acetate rayon, silk, and nylon . . . dyed at 80°F.; 140°F.; 200°F. In addition, the study includes a detailed summary of the various fastness properties, including light, metals, perspiration, and washing.

But no single volume could encompass all your specific problems. This Calco Shade Card merely emphasizes the value of coming directly to color headquarters—Calco—with your problems. Our technical staff is always ready and anxious to serve you.

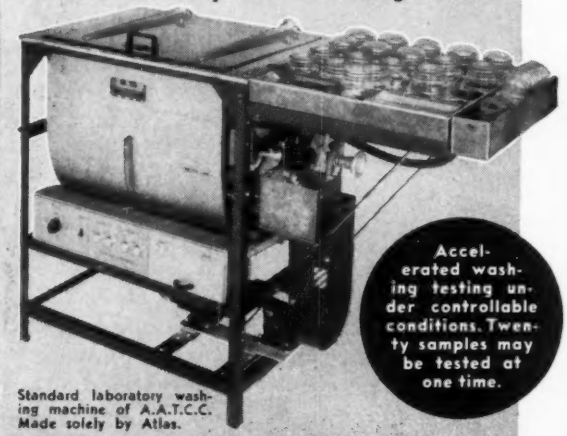
Have you a "bug" in your dyeing operations? Pass it along to your Calco representative! And if for any reason, you, as a textile executive or head of the dyehouse, have not yet received a copy of "Direct Colors on Viscose Rayon," we will be glad to see that you get one.

CALCO CHEMICAL DIVISION
AMERICAN CYANAMID COMPANY
BOUND BROOK, NEW JERSEY

BOSTON · NEW YORK · PHILADELPHIA · CHARLOTTE · PROVIDENCE · CHICAGO

LAUNDER-OMETER

for Washing Tests—Mechanical Action—Color Fastness and Staining Tests—Detergent Tests—Fastness to Fulling Tests—Leather Dyeing Tests—Dry Cleaning Tests—Vat and Sulphur Dye Tests—General Laboratory Use—Shrinking Tests.



Accelerated washing testing under controllable conditions. Twenty samples may be tested at one time.

Standard laboratory washing machine of A.A.T.C.C. Made solely by Atlas.

ATLAS ELECTRIC DEVICES CO., 361 W. Superior St., Chicago

ATLAS-OMETERS

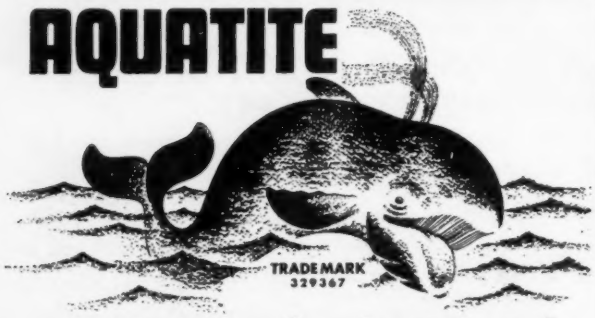
WEATHER-OMETER ★ LAUNDER-OMETER ★ FADE-OMETER

OUR MEN NEED
★ BOOKS ★

SEND
ALL YOU CAN SPARE

GOOD BOOKS ARE ON THE MARCH from your bookshelves to our fighting men. Get them out—leave them at the nearest collection center or public library for the 1943 VICTORY BOOK CAMPAIGN.

AQUATITE



A Whale of a Finish

AQUATITE, A

A one bath water repellent finish for hosiery, cotton duck, rayons, satins, etc., which meets exacting Government specifications as well as all civilian standards.

•

ALCO OIL & CHEMICAL CORP.

Executive Office
Trenton Ave. and William Street, Philadelphia, Pa.

Perma-Par

PRODUCTS

FOR SPECIAL GOVERNMENT FABRICS

PERMA TERGE

A highly efficient scouring compound for use on all types of spun rayon, rayon sheers, rayon crepes, pigment and bright yarn crepes and taffetas. Scouring with Perma Terge also softens and swells the fibre. This compound is especially recommended for jig work. Now in use for special Government fabrics.

PERMA PAR R

An improved permanent Cat-ion Active Finish—Imparts to all types of fabrics a heavy, smooth softness and mellow hand. Extensively used in Government work.

PERMA PAR K

A superior two-purpose "boil-off" compound and softener. Tends to swell and soften fibres besides "boiling-off." Used also as an addition to the dyebath for better penetration and dispersion giving increased dye solubility and color value.

PERMA PAR SOL

A compound having a strong wetting, penetrating, dispersing, emulsifying and cleaning properties. A valuable assistant for low temperature and pad dyeing and an excellent cleansing agent for goods that contain graphite, loom grease, mineral and vegetable lubricating oils.

VAPOLINE

A wool carding oil for oiling loose wool or shoddy. Makes perfect and stable emulsions in water.

REFINED PRODUCTS CORP.

Plant, Laboratories and Warehouses at Lyndhurst, N. J.

New England Representatives:

E. L. LEGG, P. O. Box 597, Providence, R. I.

WATERPROOFING FABRICS FOR ARMY AND NAVY

•

If it's uniform cloth or ducks for tents, tarpaulins, etc., use—

HYDROXY* WATER-SHIELD "D"
HYDROXY* WATER-SHIELD and
MILDEWPROOF No. 1

•

If it's burlap or osnaburg for use in sand bags, use
HYDROXY* MILDEWPROOF No. 2

*(Reg. U. S. Pat. Off.)

These are approved

Kali PRODUCTS

Kali Manufacturing Company

Manufacturing Chemists

1410 North Front Street Philadelphia, Pa.

Manufacturers of Dyestuffs and Chemical Specialties

We offer to the Textile and Allied Trades a full line of

DYESTUFFS DYEWOODS

CHEMICAL SPECIALTIES

The experience gained through many years of manufacturing quality products, progressive research policies and the faith of our customers allow us to face the present emergencies with confidence.

As in the past, we are prepared to help you with any manufacturing problems you may have. We place our experience and our research facilities at your disposal.

MAY WE SERVE YOU?

COMMONWEALTH COLOR & CHEMICAL CO.

MAIN OFFICE AND WORKS: Nevins, Butler and Baltic Streets, Brooklyn, N. Y.

Philadelphia • Chicago • Charlotte • Gloversville • Kansas City • Montreal

BURK-SCHIER WET-PROCESSING AGENTS

for every textile application

AT YOUR SERVICE

Burkart-Schier Chemists and Technical Service Men are available at all times to cooperate with the Textile Industry in its processing problems

BURKART-SCHIER CHEMICAL CO.

BURK-SCHIER CHATTANOOGA, TENNESSEE BURK-SCHIER

PENETRANTS • SOFTENERS • SOLUBLE OILS • FINISHES

RAPIDASE

THE STANDARD DE-SIZING AGENT

for cottons, rayons and mixed goods

For your de-sizing problems— our technical men are at your service . . . Write or 'phone.

WALLERSTEIN COMPANY, INC.
180 MADISON AVENUE, NEW YORK

• INDEX • TO ADVERTISERS

Alco Oil & Chemical Corp.	XVIII
Alrose Chemical Co.	
Althouse Chemical Co.	Second Cover
Amalgamated Chemical Corp.	XI
American Aniline Products, Inc.	III
American Cyanamid & Chemical Corp.	Back Cover
American Dyewood Co.	
American Viscose Corp.	IX
Ansul Chemical Co.	
Aqua-Sec Corp.	
Aridye Corp.	
Arkansas Company, Inc.	VIII
Arnold-Hoffman & Co., Inc.	
Atlas Electric Devices Co.	XVIII
Becco Sales Corp.	
Bick & Co., Inc.	
Blickman, Inc., S.	
Burkart-Schier Chemical Co.	XX
Butterworth & Sons Co., H. W.	XXII
Calco Chemical Division, American Cyanamid Co.	XVII
Campbell & Co., Inc., John	
Carbide & Carbon Chemicals Corp.	IV
Carbic Color & Chemical Co., Inc.	XIV
Ciba Company, Inc.	
Colgate-Palmolive-Peet Co.	
Commonwealth Color & Chemical Co.	XIX
Du Pont de Nemours & Co., Inc., E. I.	
Dyestuffs Division	Front Cover
Electrochemicals Dept.	
Graselli Chemicals Dept.	XXI
Emery Industries, Inc.	
Exact Weight Scale Co.	
Fancourt & Co., W. F.	VI
Gardinol Corp.	
Geigy Company, Inc.	
General Chemical Co.	
General Dyestuff Corp.	VII
Hart Products Corp.	
Hercules Powder Co.	
Naval Stores Department	
Synthetics Department	
Hotel Manger	
Hooker Electrochemical Co.	
Houghton & Co., E. F.	
Kali Manufacturing Co.	XIX
Kelco Co.	
Laurel Soap Mfg. Co.	
Mathieson Alkali Works, Inc.	
National Aniline Division, Allied Chemical & Dye Corp.	XVI
National Carbon Co., Inc., Carbon Sales Division	XIII
National Oil Products Co.	
Neville Co., The	
Nyanza Color & Chemical Co.	
Onyx Oil & Chemical Co.	V
Perkins & Son, B. F.	
Philadelphia Textile Finishers, Inc.	
Philadelphia Quartz Co.	
Prince George Hotel	
Procter & Gamble	
Refined Products Corp.	XIX
Riggs & Lombard, Inc.	
Rodney Hunt Machine Co.	
Rohm & Haas Co.	
Royce Chemical Co.	
Sandoz Chemical Works	X
Scholler Bros., Inc.	Third Cover
Socony-Vacuum Oil Co., Inc.	
Solvay Sales Corp.	
Sonneborn Sons, Inc., L.	
Stein, Hall & Co., Inc.	
Union Carbide & Carbon Corp.	IV, XIII
Van Vlaanderen Machine Co.	XXI
Virginia Smelting Co.	
Westvaco Chlorine Products Corp.	
Wallerstein Co., Inc.	XX
Warwick Chemical Co.	
Wolf & Co., Jacques	XII
Young Aniline Works	
Zinsser & Co.	

HERE'S A HELPING HAND FOR VICTORY

When busy, this hand builds bombers ...but a hot spark might make it idle

GLOVES, APRONS, COVERALLS—all protective garments worn by workers in our war industries can be made "flameproof" with Du Pont Fire Retardants. It's a new safety measure which manufacturers are rapidly adopting . . . it's a new source of business for you!

From Du Pont's laboratories come a group of proven Fire Retardants. Best known of all is Du Pont Fire Retardant "CM". It gives complete protection against spread of flame or afterglow. No stiffening of fabric or efflorescence results from its use. Currently available for the most essential war uses on allocation.

Fire Retardant "T" gives complete "flameproofing." It is recommended where slight stiffening action and efflorescence are not objectionable. Available on priority for most war and civilian applications.

Other Du Pont Fire Retardants "3WG" and ammonium sulfamate are recommended for special applications.

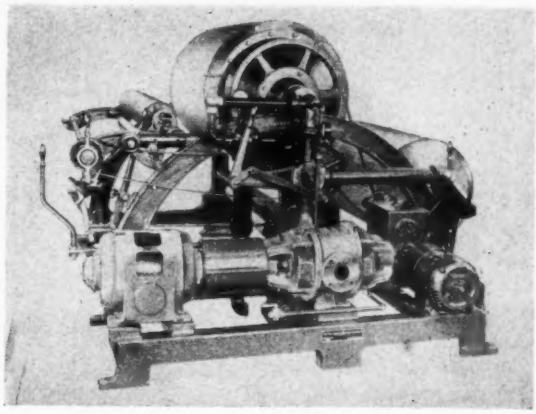
Du Pont's easy-to-use Fire Retardants flameproof all fabrics. (Except acetate type rayon.) They have a minimum effect on textile strength and do not change the color of most dyestuffs.

Tell us your problem—we will recommend the fire retardant best suited for your needs. Working samples are available. E. I. du Pont de Nemours & Co. (Inc.), Grasselli Chemicals Department, Wilmington, Delaware.

DU PONT

FIRE RETARDANTS

Better Things for Better Living . . . Through Chemistry



DECATING IMPROVES FABRIC FINISH

Viscose, acetate, Aralac and certain cottons and knitted goods can be made more appealing to the eye and hand—easily and inexpensively—by decating.

Using only one operator, this decater has by test, produced 250 yards more per hour than other machines requiring two operators.

The decating of piece dyed fabrics results in an improved quality at lower cost, due to the absence of breaks, harshness and other undesirable faults. It also results in added savings because of the smaller amounts of softening materials required. Printed fabrics show the additional advantage of decreased mark-offs, due to excessive amounts of oil which is necessary unless the piece is decated.

Since its introduction in 1937 a number of improvements have been made, making this decater faster and simpler to operate. The machine is sturdily built and complete in every detail. Just hook up steam, water and electricity.

VAN VLAANDEREN MACHINE CO.

370 STRAIGHT ST., PATERSON, N. J.

World's largest manufacturer of synthetic fabric processing machinery

On Goes the Brave Fight to Make Men Live

They carry first aid kits instead of guns . . .

They work with stretchers and surgical bandages instead of mortars and grenades . . .

The men of the Army Medical Corps and the courageous Army nurses look to the Textile Industry for vital supplies in their fight to make men live.

With one medical man to every twelve infantrymen in this great new Army of ours, there are countless first aid kits to be filled with battle dressings of cotton flannel and gauze.

At field hospitals within range of the enemy's guns, there are stretchers, tent fabrics, bedding and supplies needed in tremendous quantities.

These are some of the great contributions of the Textile Industry in this war.

Butterworth Machines play their part in the battle of production at every step in the wet end of Textile Finishing—bleaching, boiling-out, drying, calendering, dyeing.

All our facilities not required for Ordnance production are available to help you solve your finishing problem. Let us serve you now.

H. W. BUTTERWORTH & SONS CO.
Phila., Pa. Serving the Textile Industry since 1820
Offices in Providence, R. I. and Charlotte, N.C.
In Canada: W. J. Westaway Co., Hamilton, Ont.

***64%**

of equipment now in use in the wet end of textile finishing cannot operate at a profit in competition with modern machines.

*Proved by Research

Butterworth

PRODUCING GUN MOUNTS FOR THE UNITED STATES ARMY

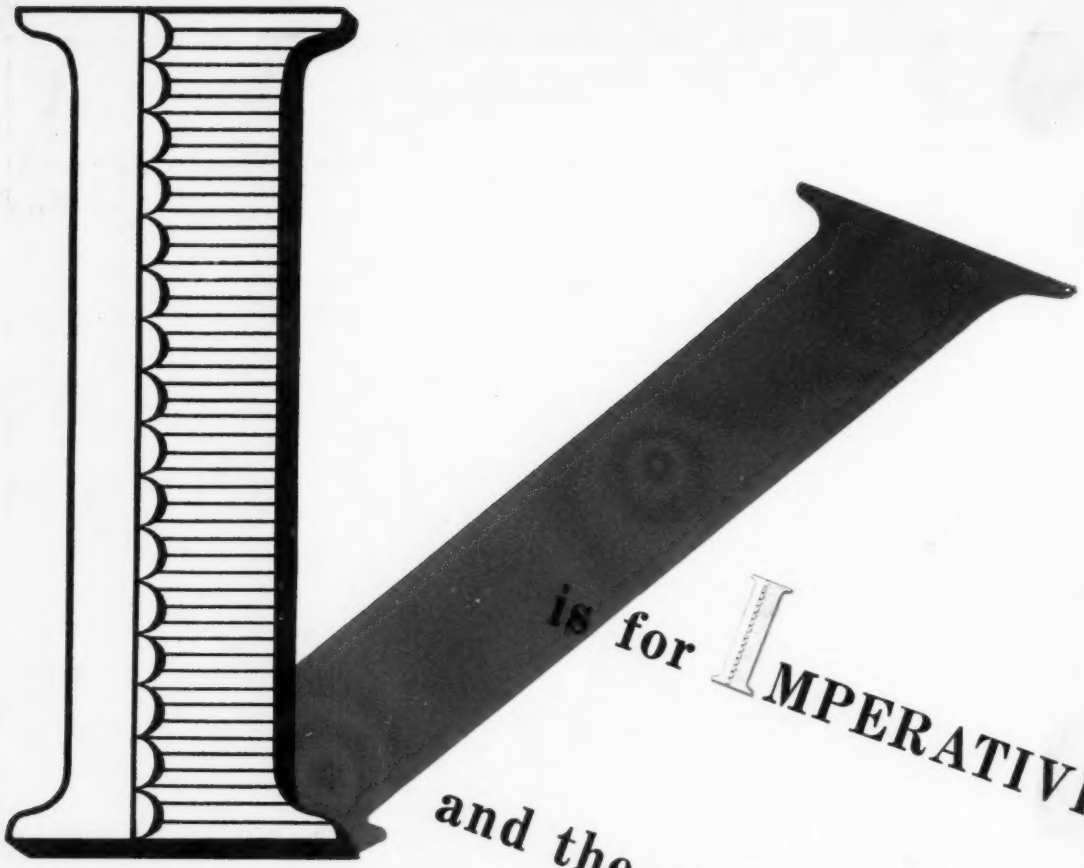
On Duty or Off

Smart? Yes, and highly efficient too—the new adjuncts to our fighting forces—and when on duty or off, many of the Fibres or Fabrics which they wear are treated with *Scholler Processing Products:* for Beauty, Style, and Long Service Life. For over 35 years *Scholler Products* have been recognized as a *standard of quality.*

DuraBeau FINISHES
REG. U.S.A. AND CANADA

SCHOLLER BROS., INC.

Manufacturers of Textile Soaps, Softeners, Oils, Finishes
Collins & Westmoreland Sts., Phila., Pa. • St. Catharines, Ont., Canada



Ideas have always been the secret weapons of American progress...the ingenuity that has initiated new ways and means for getting things done better and faster.

In these times of emergency...of imperative needs for certain chemical materials, ideas born of chemical research have repeatedly come through. New materials and new uses for others now are making it possible to sustain an ever-mounting flow of supplies to war industries. Likewise, it is enabling many manufacturers of civilian goods to circumvent critical material shortages.

If you are confronted with a problem arising out of inability to obtain chemical materials for your high priority business, or if you are faced with suspended production due to the non-priority nature of your manufacture, call upon Cyanamid. Our research chemists and engineers will be glad to apply their facilities to the solution of your problem. There is no obligation.

AMERICAN CYANAMID
AND CHEMICAL CORPORATION
A Unit of American Cyanamid Company
30 ROCKEFELLER PLAZA, NEW YORK, N. Y.

MANUFACTURERS OF
SULPHONATED OILS • PENETRANTS • FINISHES • SOFTENERS
SIZING COMPOUNDS • DECERESOL* WETTING AGENTS
AND OTHER SPECIALTIES FOR THE TEXTILE INDUSTRY
*Reg. U. S Pat. Off.